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VARIATION IN ORGANIZING THE LEXICON

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
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ABSTRACT

The meanings of words are considered in the following dissertation. The first half reviews relevant linguistic and psycholinguistic literature about lexical semantics. It is shown that most investigators have tried to discover a structured set of meaning components for describing various word meanings. The author proposes that the subjective lexicon is not simply a structured store of inherent meaning components attached to word forms; understanding word meanings is also an interpretive process. A language user considers contextual cues as well as his knowledge about the speaker, in order to decipher the appropriate interpretation for a particular instance of a word. When the context is somewhat impoverished, as in an experimental setting, subjects resort to the most conventional interpretation of a word's meaning as a basis for responding. Certain principles for utilizing frames of reference determine the nature of the conventional response. Three interpretive frames of reference are considered: concrete, evaluative, and social.

The experimental portion investigates these three frames of reference: tools and furniture words are used as examples of the concrete frame, emotion terms and interpersonal verbs illustrate the evaluative frame, and pronouns and kinship terms are social lexical sets. The subjective organization of these six lexical fields was studied by using subjects' judgements about the similarity of meaning among the terms in the set. Two techniques were used; subjects either rated similarity of meaning directly on a nine point scale, or they sorted the words into piles so that each pile had some meaning component(s) in common. The results showed that evaluative terms have a strong positive-negative component; concrete words were categorized according to location used or function, while social words were organized using ego as a reference point.

Another study compared subjects' responses to noise words with their responses to the actual noises which were the referents of those words. In both cases the results were similar, suggesting that the meanings of linguistic and non-linguistic stimuli may be processed in a similar way. This study also showed that subjects will respond idiosyncratically when they have insufficient contextual information for determining an appropriate conventional response.

The final chapter discusses cognitive processing and speculates that the frames of reference represent cognitive strategies for interpreting meaningful stimuli. The chapter also presents some suggestions for further research in lexical semantics.

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OVERVIEW

The study of meaning is as complex and intriguing as the human mind which finds meaning in almost all aspects of experience. Even when the area of concern is restricted to word meanings, as it is here, one cannot hope to account for all facets of meaning. The following chapters present those aspects most important for developing a theory of lexical semantics. There are two main sections; a literature review and theoretical discussion of approaches to word meaning, and some experimental investigations of the ways people organize words according to their meanings.

In the past the view has prevailed that meaning is a property of words which can be investigated independently of real world considerations. The present author does not accept this view as a viable approach to understanding meaning. Things (including word forms) do not *have* meaning; they are endowed with meaning by thinking and feeling human beings who have certain expectations about the events and experiences affecting their lives. When confronted with a meaningful stimulus a person tries to interpret it by using information about the present context and his past experiences. Understanding meaning is a dynamic process whereby all relevant information is sampled and monitored until the message has been satisfactorily deciphered. The literature review and the experimental results reported below were both interpreted with the preceding assumption in mind.

The first chapter discusses the various kinds of relationships which might hold among word meanings, such as synonymy or antonymy. Words which share meaning components can be organized into lexical fields; it is often assumed that these fields might characterize the structure of a language user's internal lexicon. It is the opinion of this author that lexical fields do not represent mental constructs; rather, they are simply a convenient descriptive device for showing relationships among word meanings.

In Chapter 1 it is also noted that the connection between a word form and its meaning is essentially arbitrary. However, the meaning a particular speaker assigns to a word does not necessarily appear arbitrary to him since the conventions for communication in his society constrain the meanings which might be assigned to words. Later chapters develop the notion of conventional meaning, and it is proposed that people are aware of what is conventionally acceptable in their linguistic community. They use this conventional knowledge in deciding how to respond in an experimental task.

The second and third chapters review linguists' and psychologists' attempts to find the semantic properties attached to words. Some researchers in both disciplines have assumed that there is a linguistic semantic aspect of word meanings incorporated into a grammar which is separate from the other types of meanings associated with words such as their affective or referential meaning. Much of the discussion in these two chapters is devoted to showing that attempts at quantifying linguistic or some other type of meaning have failed because it is impossible to separate meaning from the people who use it.

The fourth chapter presents some of the issues relevant to a theory of lexical meaning. The author proposes that people are much more actively involved in the interpretation of meaning than has generally been supposed. Context is important in guiding a language user as to how a lexical item ought to be interpreted. The more specific the context, the more clues a hearer has for the interpretation of meaning.

When context is at a minimum, language users resort to the most conventional interpretation acceptable in their linguistic community. It is the opinion of the author that people do not merely search some sort of a structured lexicon for word meanings. The interpretation of meaning can also be a process whereby people make use of all kinds of information available to them. Language users also employ certain principles for organizing information as an aid to interpreting meaning. These organizing principles are called frames of reference; three such frames are discussed: concrete, evaluative, and social. It is suggested that these frames may correspond to three basic human activities: making affective judgements, categorizing environmental stimuli, and social interactions.

The remaining chapters describe experimental investigations which provide empirical evidence for some of the proposals in Chapter 4. Chapter 5 presents the technical details of the data gathering and data analytic methods. Then, the following chapter reports evidence for the three frames of reference. Two different lexical fields are used to illustrate each frame. In each study, it is assumed that subjects responded with what they thought were conventionally acceptable responses, since the experimental setting provided enough contextual information for subjects to access conventional information.

One of the two studies reported in Chapter 7 shows that subjects will respond idiosyncratically when they do not have enough contextual information for deciding on a conventional response. The other study supports the author's contention that linguistic material is not necessarily processed differently than nonlinguistic stimuli. Subjects responded to words and the physically perceptible referents of those words in a similar fashion. If words evoke a uniquely linguistic response, as many theorists claim, the lexical stimuli should have produced different results than the perceptual stimuli. Since the responses were similar for the two types of stimuli, it is likely that the meanings of words and the cognitive representation of percepts are also similar.

The final chapter presents the author's (highly speculative) conclusions about lexical meaning. It is suggested that employing frames of reference for interpreting word meanings may be part of a general cognitive strategy for interpreting meaningful stimuli. The final chapter also contains several suggestions for further research in the area of lexical semantics.

CHAPTER 1

WORDS AND MEANINGS

Introduction

In many primitive societies words are endowed with powerful magical properties and to speak certain words is to evoke their magic. Even in our society words are sometimes treated as if they were the things they represent rather than mere labels; many hotels, for example, will not label a thirteenth floor because the word *thirteen* is considered to be unlucky. Words are the most fundamental meaning conveying elements of a language. Children are aware of their usefulness for relaying messages at an early age, and words are some of the first linguistic units acquired. Naive speakers have no difficulty identifying the words of their language, but scholars have found it difficult to define *word* as a technical term. To determine the meaning of a word is a problem still unsolved by linguists, philosophers, and psychologists.

Meaning is not a state or property of words. Rather, it is a process engaged in by a communicating speaker and a hearer. During the construction of an utterance intended to convey a particular message, a speaker chooses those words which he thinks are best able to evoke his message in the hearer; he must make use of his knowledge about the world, linguistic devices, and also what the speaker assumes the hearer knows (Rommetveit, 1974). If the speaker miscalculates and the hearer interprets the intended message in an unintended way, communication is to the extent of the miscalculation, unsuccessful. One of the major themes throughout this work is that meaning must be studied as a cognitive phenomenon taking into consideration encyclopedic as well as linguistic knowledge.

Word meanings forge a link between the linguistic system and the human conception of the world. This chapter discusses two different kinds of links: *arbitrary* relationships between a word's meaning and its phonological form, and *referential* links between the meaning invested in a word and its use in denoting some aspect of the experiential world. Word meanings may also be related to each other in various ways. Linguists are most interested in the *sense* relations which hold among word meanings. It is useful to review these semantic relationships because most investigations into lexical meaning assume that some or all of these links are essential aspects of meaning.

Before this discussion goes any further, I wish to make clear the interpretation I intend for certain terms. *Meaning* will be used in a pre-theoretical fashion much as Lyons (1977) has done. It will be assumed that the meaning of a word, in part, represents its conventionalized usage in a linguistic community. The interpretation of a word's meaning depends on how it relates to the context in which it is used. *Context* implies both linguistic and situational context simultaneously. It might be thought of as the total environment in which an utterance occurs. Context may also include the mutally shared intersubjectivity of speaker and hearer.

Concepts are related to meanings and reflect an individual's organization of reality. Concepts are psychological constructs which incorporate everything an individual knows about a particular abstract or concrete entity. Concepts may be represented in language in a variety of different ways, and word meanings encode those aspects of a concept which are relevant to a particular context. Some aspects of a concept may be idiosyncratic since each person can have different kinds of experiences, and therefore, different knowledge about a particular entity. Those aspects of concepts most important to a society are the ones most likely to be conventionally represented by word meanings. Some concepts will have a highly conventionalized representation, for example, a stop sign. In such cases the word meaning is almost the same as the concept. Other concepts such as "my mother" have many idiosyncratic components and a particular token of *mother* can only convey some small aspect of this concept. Either an idiosyncratic or conventionalized component could be intended depending on the context.

The concept-meaning link is one of the factors which make words powerful information conveying devices. If someone uses a certain word, the hearer assumes that he is to consider a particular underlying concept; whether speaker and hearer both have the same or similar concepts associated with a word is a problem taken up in subsequent chapters.

A word is a phonological form conventionally attached to a contextually determined meaning. The distinction between the form and function of a word should be carefully maintained. To this end, *lexeme, lexical item*, and *word* will be employed as technical terms in the following ways: *word* will be used when referring to a particular form with all its phonological and morphological information intact. *Lexical item* and *lexeme* will be used as synonyms for referring to the designator of a concept without indicating specific morphological information (Lyons, 1977). For example, *ink*, *inker*, *inky*, and *inks* all represent the same lexeme (Moulton & Robinson, 1981). Following Lehrer (1978) *lexical set* is used for the actual words from a semantic domain used in a particular experiment. The terms *lexical* and *semantic field* will be used interchangeably throughout this work. *Field* and *domain* will also be mutually substitutable.

Arbitrary Relations

The link between a phonological form and a particular meaning is essentially arbitrary. There is nothing inherent to spoons or tables, for example, which suggests that they should be called by the phonological sequences /spun/ and /tebl/ rather than something else.

In the history of modern linguistics the arbitrary relationship between sound and meaning was probably first noticed by comparativists who worked with words from various languages different in form but having basically the same referent. It became apparent from such studies that the characteristics of objects and events did not determine how they should be called since different languages had different names for the same objects. The principle of arbitrariness became of paramount importance and was used in support of an autonomous linguistics. If there were no intrinsic connection between form and meaning, form could be studied separately from meaning (Bloomfield, 1933). The only basis for making such an assumption, however, is also to consider language as an independent entity, somehow having an existence apart from the speakers who use it.

Meaning is extrinsically imposed on a word by a language user who takes the entire communicative situation into consideration when formulating his interpretation of a word's meaning. When language is viewed in its proper perspective, as a tool employed by people for the purpose of conveying information, it becomes obvious that the word as part of a shared language system is not arbitrary for the individuals who use it. It is important to recognize the distinction between the intrinsic and extrinsic nature of lexical meaning. Many theoretical discussions approach lexical semantics from the intrinsic point of view. The present author will attempt to develop a framework for discussing lexical semantics using an extrinsic perspective.

Saussure (1966; Culler, 1976) is generally credited with formulating the principle of the arbitrariness of the sign and much controversy has centered around this notion. A great deal, of course, depends upon how the concept of arbitrariness and the concept of sign are defined. Friedrich (1975) takes arbitrary to mean completely random, in which case he is quite correct in saying that the sign is not arbitrary, since the form of a word is, at the very least, restricted by the phonological and morphological system of a language. Others (Wescott, 1971; Sebeok, 1975) assume that the concept of arbitrariness implies conventional sound-meaning relationships in opposition to natural ones, and they are correct in saying that the sign is arbitrary, because the assignment of a particular meaning to a particular form is maintained by an implicit agreement among the members of a society. A speaker cannot call an object by any label he chooses and still expect to be understood. For the purposes of this discussion Saussure's notion of arbitrariness will be adopted and it will be assumed that there is no natural or intrinsic bond between a concept and a sound image except for special cases such as onomatopoeia.

The form-function relationship may be arbitrary, but it is also conventional. Speakers and hearers share the same communication system (more or less) and it is the conventionalized usage of word meanings which allows for linguistic interaction.

> It is precisely because the relationships among these systems are learned, conventionalized, and essentially held in common by speakers and hearers that the reification of meaning -- the attempt to place meaning in words or in utterances -- is fundamentally misguided. It represents a complete confounding of the medium for communication with the message to be communicated. (Baker, 1979, p. 8)

Language users naturally assume that their system of word-meaning links is shared by other speakers of their language. This has contributed to the popular notion that words have meaning, and to naive speakers, a word can appear to be motivated either phonetically, morphologicaly, or semantically. The following discussion of different kinds of motivation is based on Ullman's work (1966; 1967). These types of motivation stem from language users' perceptions of the link between meaning and form.

Morphological motivation is based on knowledge of derivational processes. For example, a child I know created *fruitetarian* by means of analogy with *vegetarian* as a name for someone who eats a lot of fruit. A speaker's perception of a morphological motivation which is in reality nonexistent can lead to misconceptions about the world, as in the case of the child who refuses to eat *hot dogs* because he thinks they are made from dogs.

Semantic motivation is the process behind the proper interpretation of metaphors such as *foot* of a mountain or a *coat* of paint. One might argue that such semantic connections are the basis for all types of metaphor, whether conventional ones like those given above or the nonce forms found in literature. The interpretation of a metaphor arises from the interplay between the linguistic system and what people know about the world.

The principal feature of phonetic motivation is that meaning and form may influence each other. This motivation is the primary process in Taylor and Taylor's (1964) theory of how sound symbolism works its way into a language, and also in Bolinger's (1940/1965; 1949/1965) discussion of word affinities. By phonetic motivation Ullman means onomatopoeia, but sound and meaning may interact in other ways as well. The perception of a meaning may lead to a change in phonemic shape. For example, on a nightly news show a sportscaster referred to "soccer affectionados", quite logically since a devoted fan has affection for his sport. The interaction of sound and meaning may stimulate semantic changes, especially when two similarly pronounced words appear to compete in the same semantic field. In Spanish, *veneficio*, "malevolent", clashed with its phonologically similar antonym *beneficio*, and the former disappeared from the language (Bolinger, 1949/1965).

The form-function interaction is also the explanation for folk etymologies, the phenomenon whereby speakers attempt to make semantic sense out of words by reinterpreting their sound. *Coleslaw* comes from the Dutch word for cabbage salad, *Koolsla* (Kool = cabbage), but it is often pronounced in English as if it were *coldslaw* since this type of salad is usually chilled before serving. The originally well motivated construction has lost its obviousness for English speakers, some of whom have reinterpreted the lexical item so that it appears to be well motivated within their cognitive system.

The underlying principle in all of the examples given above is that humans expect to find order in their world and they expect things to make sense. Although a speaker/hearer may logically understand that objects are denoted by arbitrary names, he does not necessarily accept this principle when he uses his language. For a language user an object or event cannot have just any name, its label must be consistent with what he knows about the manner in which his language is used for communication and his knowledge about the world.

Referential Relations

Lexical items are the links between our language system and our experiences. Speakers use words to organize and categorize their experiences. Sometimes organization in the real world contributes to apparent semantic organization and sometimes a previously conceived semantic structure helps an individual assimilate new experiences into what he already knows.

Learning the meanings of words requires two basic skills: one must be able to segment the experiential world in a manner appropriate for lexical labeling, and one must recognize recurring instances of the same experience, even under widely different circumstances (Brown, 1958b; Bolinger, 1975).

> The two central skills, ability to name instances and ability to react to the name as a sign of an instance, are both created by experience of the name in association with instances of the referent category. This is an experience that comes early to all children and these are skills that adults everywhere look for as evidence of the comprehension of linguistic forms. The reference-making

> procedure and the two abilities it creates are central to the language game. (Brown, 1958b, p. 107)

Reference is the term traditionally used for the relationship between objects and words, and has been interpreted in two different ways, as the link between a particular utterance and a specific entity (Lyons, 1977), and as the link between a word and the class of entities to which the word may be correctly applied (Palmer, 1976). The latter usage makes reference synonymous with denotation. Usually, the term reference is used in a general way to apply to either type of link. In the following discussion the *referent* will be assumed to be the topic of a particular utterance or discourse whether it is one specific entity or an entire class.

Most discussions of reference have been restricted to concrete nouns and adjectives since they are labels for easily identified objects and attributes, and the study of word meanings has often been approached as if these were the only two types of words speakers and hearers use. Actions, as designated by verbs, and abstract entities such as *truth*, *beauty*, or *thinking* are also meaningful lexical items, but it is difficult to define them ostensively, a procedure more easily applied to words with concrete referents (Brown, 1958b; Lyons, 1977; Palmer, 1976). Reference deals with the relationship between linguistic units such as words and sentences and the entities a speaker wishes to discuss, and is therefore important for the ways experiences are encoded by language. One important function of reference is to indicate the particular item which is the topic of a particular utterance. This is often accomplished by the use of attributive expressions. For example, the utterance "the man with glasses" indicates one man out of all the men available as topics of conversation. Attributive expressions may also be used to indicate non-specific referents (Lyons, 1977). If someone says "Maria wants to marry a man with glasses", it may be the case that the speaker has a particular man in mind or simply any man with glasses.

The difference between correct and appropriate reference is one aspect of the relationship between words and the experiential world which is often overlooked. For example, someone may successfully but incorrectly refer to a hill as a *mountain*. Successful reference depends on the speaker and hearer having some notion of each other's world view. Someone who hears *mountain* when *hill* would be more appropriate will rely on contextual cues to help him interpret the speaker's message. Hearers do not simply listen to what speakers say but also pay attention to how, when, and why, an utterance was produced.

Reference does not only cover the subjects of particular utterances; it also designates in a more general way the link between words and the sets of objects denoted by those words. *Extension* is the term usually used to indicate the link between words and their referents. A class of objects is defined extensively when all of its members have been listed. With this approach it would not be necessary to have any criteria for deciding category membership since all class members are known.

Simply knowing the extension of a term is not the same as knowing its meaning. If extension were the only possible way to define words, we could not know the meaning of a word like *dog* until we had seen every dog in the world. The meaning of lexical items which have no real world referents can also be understood; for example, mythological creatures such as *unicorn*, or nonexistent titles such as *mayor of the moon*.

Intension is an alternative to extensive definitions of words. Defining through intension involves listing the essential properties for determining class membership and then deciding whether some entity has those properties.

Intension covers that part of meaning which is distinct from reference. Two expressions can have the same extension but differ in their intension. For example, *my darling baby brother* and *that dirty bum*, have the same extension but they certainly do not convey the same information about him.

The distinction between intension and extension is important to linguistic semantics although there is not always consistent use of these terms. Extension has been associated with reference and intension with the philosophical notion of sense, briefly discussed in the next section. Intension and extension have also been associated with the distinction between connotation and denotation (Ogden & Richards, 1930), although intension should include more than the affective reactions to words. The distinction between intension and extension is also relevant to the debate within linguistics as to how much real world knowledge ought to be incorporated into a semantic theory. This issue is discussed in the next chapter.

Both intensive and extensive definitions may be used for describing the meanings of words. An important part of knowing the meaning of a word is being able to list particular instances (Brown, 1958b), and it is also important to know essential attributes so that new instances can be identified. Children probably learn meaning both by being told what class an entity is a member of, and by having characteristic properties brought to their attention.

Sense Relations

In the philosophical literature on semantics, sense is contrasted with reference. The definition of "sense" is never very clearly stated, but it generally designates that part of meaning distinct from reference (Frege, 1952). In the philosophical literature sense is considered to be that part of an utterance which allows the analyst to assign it a truth value. Utterances with no real world referent can still have a sense and therefore be interpreted. Sense is also considered to be closely linked to intension discussed in the previous section. Some linguists (Lyons, 1977; Palmer, 1976) define sense differently than the philosophical notion stated above. For them, sense covers those relations which form the links among word meanings within a linguistic system and are in contrast with referential relations which are those links between word meanings and objects or events.

According to these linguists the inter-word sense relations are best described via lexical fields which are important constructs for studies of word meanings. Lexical fields are used in theories of lexical semantics to describe the types of meaning relationships which can hold among semantically related lexical items. The lexicon is often considered to be a collection of variously structured fields. This view assumes that the lexicon is a static "structure" or collection of structures present in language users' minds. Later chapters will present the notion that lexical meaning can be dynamically interpreted by language users. The interpretation of meaning is affected by context and a person's past experiences. The various contexts provide frames of reference enabling the speaker/hearer to find the appropriate interpretation of a word.

In spite of the widespread acceptance of the notion, most authors do not take the trouble to provide a carefully thought out theoretical definition of a lexical field. Instead, they usually adopt a 'working definition' such as "... a semantic field is a 'group of words closely related in meaning, often subsumed under a general term'" (Lehrer, 1974, p. 1), and leave it to examples to demonstrate what a lexical field might be. A working definition such as the one quoted above is a gross simplification of the extremely complex relationship between words and the concepts which are their referents, and merely makes explicit the layman's intuition that semantically similar words seem to belong together. Surely specialists in this area can do better.

The purpose of this section is to discuss current linguistic views of lexical fields and to show how certain assumptions about fields are based on misapprehensions of the relationship between phonological forms and meanings. The experimental results presented in Chapter 6 suggest different organizational principles for lexical fields than those proposed by some field theorists. The interested reader will find excellent historical reviews of the development of the field concept within lexical semantics in Lyons (1977) and Ohman (1953). Verschueren (1981) has reviewed some of the current problems with linguistic theories of lexical semantics.

Most studies using lexical fields have been concerned with fields formed from paradigmatically related words, but it is also possible to have fields based on a syntagmatic principle (Lyons, 1977) which groups sets of lexical items appearing frequently together in utterances and thereby develop a semantic link, for example, *hair-blonde*, *lick-tongue*, or *landlord-rent*. Collocational fields have not been given much attention in North American linguistics although there is interest in England which stems from the theories of J. R. Firth (1935/1957; 1951/1957).

More attention has been paid to the paradigmatic relations which may hold among lexical items than to the syntagmatic ones. According to theories about lexical fields, lexical items may be related by *synonymy*, *homonymy*, *partonomy*, *antonymy*, and *hyponymy* (hierarchically) (Lyons, 1968; 1977; Lehrer, 1974; Ullman, 1967). The various nuances of a single lexical item are discussed under the notion of *polysemy*. The paradigmatic relationships are assumed to hold in all contexts for any given set of lexical items. This is not always the case, however, particularly for synonymy, and hyponymy. The extent to which the paradigmatic semantic relationships appear to hold among a set of words is a result of the shared conventional knowledge of a linguistic community. For example, people know that *love* and *hate* are antonyms because this is a conventional interpretation in our culture. This conventional interpretation results when people realize that the experiences they call *love* appear to be opposed in some way to the experiences they call *hate*. Sense relations, then, are determined both by conventional linguistic knowledge and personal experiences.

Synonymy holds between words which are similar in meaning to the extent that they are mutually substitutable in some contexts. Sometimes synonymy is interpreted to imply that two words must be identical in meaning and, since this is impossible, there can be no synonymy. This interpretation of synonymy arises when words are considered as isolated entities apart from any context. Of course, no two words will have identical meaning in all situations; synonymous words are substitutes for one another in some, but certainly not all, contexts. For example, *bachelor* and *unmarried man* are synonymous in most utterances, but after *swinging* or before *apartment*, *bachelor* seems the more appropriate lexeme. In actual utterances of course, only one of the synonyms appears and the hearer does not concern himself with the lexical items the speaker did not choose, but only in understanding the intended message. Language users are aware of the similarities and differences in meaning among words and this principle is important for several of the experimental methods discussed in Chapter 3.

Homonymy and *polysemy* are the extreme end points of a scale measuring the shades of meaning a word can represent. A linguist or lexicographer may encounter the same phonological form in two very different contexts, and he must decide whether the lexical item represents two distinct meanings or variations of one basic meaning. *Stock*, for example, can be used for merchandise in a warehouse, shares of an enterprise, or farm animals such as cattle (Nida, 1975, p.134). Each of these meanings may be related and could be considered to be polysemous. There is also the apparently unrelated meaning of *stock* in the sense of a soup base.

A dictionary indicates differences in relatedness of meaning by having two separate entries for homonymous words and several subentries for polysemous items. Etymological criteria are often used for deciding whether there are two homonyms or one item with various nuances of meaning. Historically unrelated words are considered to be homonyms while items with a common etymology are assumed still to be related in the modern language. Lyons (1977) points out that it is not always clear what constitutes an etymological relationship between two words. A common ancestor might be found if two words are traced back far enough. However, if the common link is no longer obvious the two words should be considered as separate lexical items. The etymological approach is also unacceptable to many linguists who have insisted that diachronic information is not allowable in formulating synchronic descriptions.

Clear cases of homonymy offer little problem to the lexicographer. It is much more difficult, however, to decide how the different polysemous meanings of a word ought to be represented since various types of interrelationships may hold between the different meanings. There may be a core meaning from which all other senses are derived. It is also possible that the polysemous entries share common meaning components without actually being derived from a single core.

However it might be described or analyzed, polysemy is an important aspect of language. Many linguists (Lyons, 1977; Nida, 1975; Ullman, 1967), and some psychologists (Caramazza & Grober, 1976) have noted that polysemy contributes to the communicative efficiency of language. The language user does not have to learn a different form for every possible sense. Instead, he learns relatively few forms, and depending on context, he can derive the appropriate interpretation from a general or core meaning.

Antonymy is the term used for the ways in which words may have contrary or opposite meanings. An assumption implicit to all discussions of antonymy is that in order for two words to be antonyms they must first share some meaning components. Lyons (1968) makes three distinctions in oppositeness of meaning; complementarity (non-gradable antonyms), antonymy (gradable antonyms), and converseness.

Pairs of complementary lexical items are related in such a way that the meaning of one automatically excludes the other, for example, *male-female*, *married-single*, or *animate-inanimate*. The distinctive features of componential analysis described in the next chapter come from sets of complementary antonyms.

Gradable antonyms are the end points of a relative rather than an absolute scale. Temperature terms are an example of this type of meaning relationship. The negation of an item at one pole does not necessarily imply the affirmation of the item at the other extreme. *Hot* and *cold* are usually considered the opposite poles of the temperature domain but *not hot* does not automatically suggest *cold* in the same way that *not married* implies *single*; *not hot* is probably somewhere between *hot* and *cold*, most likely toward the warm end of the scale. A further characteristic of gradable antonymic scales is that lexical items can usually be found to label intermediate values, in the case of temperature terms we have *warm*, *tepid*, and *cool*. The end points of the scale can also be extended by adding *freezing* and *boiling* to the set, suggesting that the poles are not fixed but are flexible. The lexical items which fall along a gradable antonym scale form a lexical field with a unidimensional structure.

The converseness relationship holds between pairs of words expressing basically the same meaning but from different points of view, for example, *parent-child, buy-sell*, and *ask-tell*. Converse lexical items relate people or events in the real world through their meanings and the relationship must hold in both directions, if *A sells Y to Z* then it must also be the case that *Z buys Y from A*. Pairs of converse items share semantic features which make them appear to be semantically related within a lexical field. At the same time, they have features which are in opposition and may cause the members of a pair to appear on opposite sides of a lexical field.

Lexical fields are usually described as having some kind of internal structure, the most common one being hierarchical, where a field is dominated by a single superordinate term with various sub-levels. This type of structure is the easiest to describe, especially since it reflects many native taxonomies discovered by anthropologists. The subordinates are said to be *hyponyms* of their superordinate and all words at the same level in the hierarchy are co-hyponyms. The relationship between a superordinate and its hyponyms is one of class inclusion. It is assumed that lower level items contain all the semantic features of their immediate superiors plus at least one additional feature, so anything which can be said about a superordinate may also be stated about its hyponyms but not the other way around (Lyons, 1977). An illustration of the hierarchical structure of the color lexical field is given in Figure 1.1 on the next page.

"Hierarchic structure of fields" represents a theory about the organization of the lexicon of a language. The strongest version of this theory holds that: 1) no lexeme is a member of more than one field, 2) every lexeme belongs to some field and there are no fields with only one member, 3) all fields have a hierarchic internal structure, and 4) lexical items at one level of the hierarchy may not be used in contrast with words at another level in the same field (Lyons, 1977). The idea of contrast within a field comes from Saussure's description of language as a system where each element contrasts with all the others, and it makes the strong version of field theory particularly restrictive since, for example, in the field of color nouns illustrated in Figure 1.1, *crimson* could not be used in contrast to

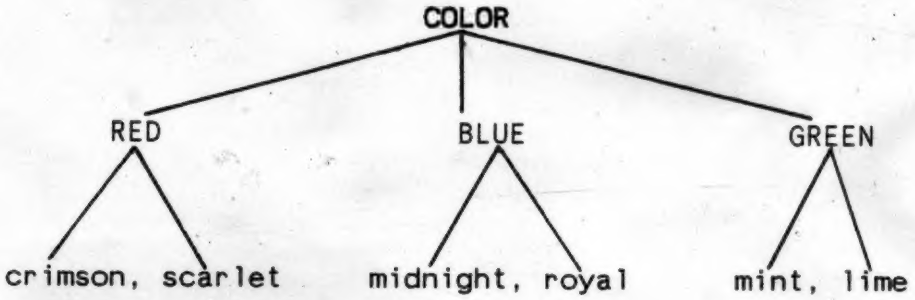

Figure 1.1. **An example of a hierarchically structured lexical field.**

green (only *red* or *blue* can contrast with *green*), but only with *scarlet* which is at the same level of the hierarchy. This would not serve as a model for language use since language users do not consider all the words *not* used in a particular utterance (Verschueren, 1981). Instead, they concentrate on the actually occurring lexical items. The strong version of field theory does not represent psychological organization of lexical fields.

It has become obvious that most fields are not neatly structured so that the strong version of hierarchic field theory is not seriously considered today. Not all fields can be described as having a hierarchic structure either.

Kinship terms, for example, have at least three dimensions based on sex, age, and lineality (Goodenough, 1965; Romney & D'Andrade, 1964; Wallace & Atkins, 1960). The part-whole relationship (partonomy) represents a different kind of hierarchic organization from the one just described and would therefore also invalidate the limits set by a strict structure of top-down levels.

It is perhaps a historical accident that hierarchical structure has been attributed such importance in lexical semantics, a result of psycholinguistic and anthropological investigations which have found that the most accessible lexical fields for study were those which appear to be hierarchically organized, such as color terms or plant and animal taxonomies. There is some evidence that these supposedly neatly organized fields are exceptional rather than typical of field structures (Nida et al., 1977; Rice, 1980). The question of what a typical lexical field looks like has not been seriously considered. Hierarchical structure has been assumed to be the most common type of organization by default. As more becomes known about other types of organizational principles for lexical fields, hierarchy should lose its dominance as a structural type. Fillmore (1978) has suggested several different types of fields which do not involve a hierarchic structure.

The various kinds of semantic relationships described in this section are thought to hold among the linguistic meanings of words, but they are viewed as somehow distinct from their conceptual or psychological meanings (Lyons, 1977; Miller & Johnson-Laird, 1976). The lexical fields are considered a part of the linguistic system of a language and are laid over corresponding universal conceptual fields. In Saussurean terms, lexical fields are forms which impose structure on conceptual substance. This two level conception of meaning probably developed when it was realized that not all languages had words for the same kinds of referents, but it was assumed that the real world appears the same to all humans (Berlin & Kay, 1969; Bierwisch, 1970; Katz & Fodor, 1964).

Another factor which makes the distinction between lexical and conceptual systems seem plausible to semantic theorists is the phenomenon of lexical gaps. Lexical gaps are only possible when words are arranged in a lexical field in such a way that a 'hole' in the system becomes apparent. For example, the male and female young of many species of animals can be called by separate lexical items in English such as, *human: boy, girl; horse: colt, filly*. There are no corresponding common terms, however, for the male and female young of dogs and cats.[1] Since the latter are the subject of conversation at least as often as horses, one cannot assume that frequency of usage is a determiner of whether or not lexical gaps will occur.

Lexical gaps may be more apparent than real since they are made obvious through a componential analysis of items in a lexical field (see the next chapter for a discussion of this analytic technique), with the analyst determining which features will be used to impose a structure on the set of words. The analyst creates the structure which makes the gap obvious and then assumes that native speakers should be aware of a deficiency in their language corresponding to the proposed gap (Hormann, 1981). Speakers are only aware of functional gaps, the unavailability of a single lexical item for the concept they wish to convey at a particular time (Lehrer, 1974). Even then, the deficiency does not present any great difficulty since a functional gap can be filled by a syntagmatic combination of lexical items which will convey the appropriate message.

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[1] Breeders and other experts may have terms for these missing lexical items since the distinctions are important for their interests. An example of a specific term used by cat breeders is *queen*, which designates a female cat being bred.

From the language user's point of view, functional gaps are more important than what Lehrer (1974) calls matrix gaps. These are the "holes" which appear in a constructed lexical paradigm such as the terms for the male, female, and young of various animals. It is doubtful that speakers are aware of these matrix gaps which may only be a product of a linguist's imagination. The next chapter describes linguists' attempts to regulate meaning within the linguistic system. There it is argued that the linguistic system is more restricted than is generally supposed because the encoding of meaning by lexical items is, in many ways, unsystematic and variable.

Lexical matrices may not reflect conceptual or even real world organiztion. It is however, an interesting question as to why some cultures encode certain concepts with single lexical items while other cultures must make use of the entire linguistic system (lexicon, syntax, etc.) in order to express the same concepts. I do not wish to join the debate on linguistic relativism, because I think it is impossible to determine how much a particular language influences one's world view or, conversely, what effect one's world view has on one's language.

It is important to note that lexical items seem to have a special status as linguistic devices for talking about the world. Many words represent conventionalized situations within a culture. Verbs of judging (Fillmore, 1969; Magnera, 1977; Marckworth, 1978), for example, carry with them implications of good or bad actions. In addition, some verbs such as *defend* may suggest certain kinds of circumstances, such as a courtroom, lawyers, judge, and jury. Of course, *defend* does not exclusively have a legal meaning and context will indicate which interpretations are most appropriate. The experimental results reported in Chapter 6 seem to reveal some of the important aspects associated with the conventional scenes represented by certain words.

Conclusion

Words are conventionalized labels for frequently repeated concepts; there is usually no one-to-one correspondence between forms and particular concepts, except for those highly conventionalized concepts important to the functioning of a society. Any concept may be expressed in a variety of ways depending on the situation in which a speaker finds himself and how much information he feels it necessary to convey to his hearers. For example, *dog, furry beast*, and *stupid clumsy animal* may all represent different aspects of the same referent. The important point here is that word meanings cannot be separated from a person's conceptual view of the world. The various types of motivation for word meanings and the paradigmatic semantic relationships discussed in this chapter result from language users' perceptions of word meanings.

The linguistic theories discussed in the next chapter and the psycholinguistic investigations reviewed in Chapter 3 have often assumed a static notion of lexical meaning. It was assumed by both disciplines that a speaker's lexicon was organized according to fixed categories such as lexical fields. The discussion of sense relations has shown how linguists have analyzed the structure of lexical fields. The goal of most psycholinguistic experimental investigations into lexical meaning also was to discover the structural properties of lexical fields, although this goal was not always explicitly stated. Usually, the experimenters said they were attempting to discover whether the internal organization of a lexical field was in terms of discrete features or underlying continuous dimensions.

The present author does not consider a semantic field to be a fixed structure inherent in the mental lexicon. In the following chapters a field is considered to be any set of words (forms and meanings) which may be grouped together on criteria of similarity of meaning whether for experimental or descriptive purposes. The structure of a field may change as the criteria for judging similarity of meaning are varied. The observed organization of a field will be a function of what a native speaker knows about the concepts represented by words and how these concepts can be related to each other as a function of the particular situation. Assuming that forms can only be related semantically through their meanings and that these meanings reflect underlying concepts, I can see no logical distinction between a structural organization based on a lexical or on a conceptual field.

The discussion of different types of lexical fields presented in the previous section implied that the lexicon has been viewed as an invariant structured entity; when someone hears a word, it was assumed that they look it up in the appropriate field to determine its meaning. I view lexical meaning from a dynamic point of view. Instead of structural types of fields it will be assumed that language users make use of various frames of reference. The frame of reference used at a particular time will depend on how an individual interprets the context in which a word appears.

If two people share many common experiences they use their knowledge of each other to construct an enriched context which can provide a very specific frame of reference for interpreting lexical meaning. An example of an enriched context might occur when two lovers are communicating. They can convey entire messages with a word or even a single glance (Rommetveit, 1974).

Impoverished contexts require that the language user rely on conventional interpretations for meaning. Such contexts often occur in psycholinguistic experiments where lexical items and even entire sentences are presented in isolation. Data from such experiments is often consistent across subjects because the subjects are using conventional frames of reference to perform the tasks. Experimental conditions can be varied, however, so that subjects use idiosyncratic rather than conventional perspectives. Such a study is reported in Chapter 7.

The experimental portion of this work (Chapters 5 - 7) is directed toward the goal of discovering the organizing principles used by subjects when presented with a semantically related set of words. These organizing principles will be called *frames of reference*, and in many cases they will resemble lexical fields. The term *frame of reference* is used instead of lexical field to indicate that lexical meaning is an interpretation placed on words rather than an intrinsic property to be found in words. Frames of reference are not exactly the same as schemas or scripts, but they do include some of the schema notions in that particular types of words or events may have conventionally accepted "stories" of procedures associated with them. Frames of reference are discussed in more detail in Chapter 4 and experimental evidence in support of three different frames is presented in Chapter 6.

CHAPTER 2

LINGUISTIC THEORIES OF LEXICAL MEANING

Introduction

Linguists have systematically described the sound system and the syntactic structures of various languages but they have been less successful in arriving at a description of the ways in which meanings can be expressed through language. Most linguistic semantic theories have attempted to assign meaning to the highest level in a grammatical hierarchy which starts with phonemes and works up through morphology, syntax, and finally semantics (Bloomfield, 1933; Nida, 1951; Katz & Fodor, 1964; Jackendoff, 1972). According to this view, the linguists' job is to determine which components of linguistic meaning are part of a grammar. When linguists talk about meaning they are referring either to the meanings of sentences as wholes or to the meanings of individual words, and sometimes both at once.

This chapter reviews some of the current trends in linguists' thinking about meaning. Linguists have not been very successful at formulating a linguistic theory of meaning; generative grammarians, in particular, have viewed meaning as subordinate to syntax. In this school of linguistics, semantics is considered as sort of an appendage to the grammar, what Hormann (1981) has called the "poor relative" of syntax.[1]

Many semantic theories within the generative grammar framework have attempted to restrict the role of the semantic component. On the one hand it has been assumed that syntactic structures can be studied independently of the kinds of information they convey. On the other hand, it has also been assumed by some theorists that there can be a linguistic semantics which does not take real world knowledge into consideration. This chapter will try to show that such approaches which initially attempt to bypass meaning, are bound to fail because many utterances can only be understood through reference to knowledge of the world and not just a derivation of linguistic structures.

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[1] The term grammar is used in several ways in the linguistic literature; for some authors it covers the entire linguistic system of a language, including phonology, morphology, syntax, and semantics. For others it refers to morphology and syntax, while some linguists use it synonymously with syntax. The term grammar is used here to cover all aspects of the language system which can be described as falling into systematic patterns.

Autonomy of Syntax

American linguists have generally considered meaning as a less significant aspect of language than grammatical forms. This attitude can be traced to Bloomfield's (1933) statement that meaning should be excluded from linguistic descriptions. Bloomfield defined "... the *meaning* of a linguistic form as the situation in which the speaker utters it and the response which it calls forth in the hearer" (1933, p. 139). According to Bloomfield, the meaning of an utterance would be fully described when the situation, including the internal physical states of speaker and hearer, have been scientifically measured and catalogued; but, since technology has not advanced to the point where this task can be easily accomplished, linguists are justified in ignoring semantics.

The structural linguists, who were followers of Bloomfield, have not completely ignored meaning. No field linguist, for example, has provided a description of a language devoid of glosses for the meanings of words. In addition, the notion of differential meaning has played an important role in the formulation of phonological descriptions; the analyst discovers phonemes by presenting his informant with two forms differing slightly in the pronunciation of one segment and asks whether the two words mean the same thing or not; if they do mean the same thing the linguist concludes that the differing phones belong to one phoneme. Differential meaning is used as a tool for field research. It does not constitute a description of what the words actually do mean, but descriptive linguists cannot honestly argue that they are not interested in meaning. A linguistic description which only stated that two forms of a language differed in meaning would be completely useless for someone attempting to study that language.

Generative grammarians have continued to accept the structuralists' notion that linguistic structures can be studied independently of the meanings which they convey. The main thrust of their view of autonomy of syntax is that grammatical categories can be determined independently of semantic considerations. The implication is that syntactic structures are devoid of any information content. For the most part this is not the case since grammatical information is very important for indicating things like the subject of the discussion, number, tense, etc.. The interpretation of grammatical devices may not vary with context as word meanings do, but they still convey information important to the communication of messages (Baker, 1976; Derwing, 1980).

It was thought that autonomy of syntax explains why language users acquire similar phonological and syntactic systems even though the meanings they assign to words may differ (Chomsky, 1979). This notion is based on false assumptions. The end results in speaking may appear to be the same across individuals, but this does not prove that the individual grammars were arrived at in the same way. There is, in fact, no way to know if all language users do have identical grammatical systems.

Even if speakers of a language do have highly similar grammars, it does not follow that these systems are devoid of meaning. The structural components of a language have set information contents which vary less than the messages conveyed by utterances. The information content of linguistic devices is necessary for indicating such important signals as, "subject of" or "this is a question." Because the signals for these types of information are fixed by the grammar, the contents of messages can freely vary. For example, once there is a device for indicating grammatical subject, a language user is free to talk about any subject he chooses even *colorless green ideas*.

Pragmatic Knowledge

Some linguists, most notably Katz (1972; 1980) have maintained that there can be a linguistic semantics autonomous of language users' encyclopedic knowledge. Katz has taken the most extreme view on autonomy of semantics. He contends that sentences can have a literal meaning which can be determined independently of any real world influences. Other linguists (Chomsky, 1975; 1979; Fillmore, 1971; Fodor, Fodor, & Garrett, 1975; Jackendoff, 1981) acknowledge that real world knowledge must be incorporated into the semantic portion of a grammar.

Most of the linguists who reject autonomy of semantics have borrowed their notions about pragmatic and semantic information from philosophical discussions about presuppostion and entailments. They suggested that an utterance may represent semantic and pragmatic information in addition to its syntactic structure. Semantic information is derived from the meaning of the component parts of an utterance, and may always be judged to as true or false regardless of the context. For example, the sentence "They played a duet for piano, violin, and cello" (Leech, 1970) would be considered to be false because of the semantic incompatibility of *duet* with three instruments.

Pragmatic information is context dependent. It is important for determining the appropriateness of a particular utterance in a particular situation. For example, the utterance "Close the window" can only be appropriate if the window is open, and therefore presupposes that this is the case.

Although many linguists now agree in principle that an account of linguistic meaning must take psychological variables into consideration, in practice they look for pragmatic information by examining utterances rather than native speakers' intuitions about their language and their abilities to evaluate communicative contexts. Experimental evidence has shown that speakers' judgements do not always agree with linguists' intuitions (Leech, 1970; Spencer, 1973). Leech (1970) has shown that speakers can make use of their encyclopedic knowledge to invent plausible contexts for apparently anomalous or logically contradictory utterances. An analysis of the utterance "Mr. Smith was sitting on his own head" would suggest that this situation is logically impossible and therefore, the utterance should always be judged as false. Seventy-three percent of the respondents in Leech's study said it could be true or false, since they could imagine appropriate contexts either way.

Leech's results do not necessarily represent difficulties for all theories of presuppostion. For the Mr. Smith example it is possible to say that if the utterance is appropriate in a particular context it must be presupposed that it is somehow possible for Mr. Smith to sit on his own head. However, this type of presuppostion seems to stretch the notion of presuppostion as it is ordinarily used. Leech's study illustrates that presuppositions are not necessarily to be found by analyzing utterances, but also by investigating the ways native speakers interpret those utterances.

Lexical Decomposition

Generative grammarians might have been able to formulate a purely structural description of language were it not for the lexical items. It is impossible to have well-formed utterances (under anybody's definition of well-formed) without including words. One is faced with the problem of meaning as soon as lexical items enter the picture. Jackendoff has noted that: "Much of the difficulty in defining semantic readings arises in trying to represent the meanings of lexical items" (1972, p. 14). Generative grammarians have tended to avoid this problem by separating the semantic properties of words from their syntactic functions. Within generative grammar there is usually a theory of phrases and a theory of words; these two theories do not interact except when lexical items are inserted into syntactic structures (Williams, 1981). The point of contact between the two theories is grammatical categories such as, NOUN and VERB. Each lexical item in the lexicon is marked for the categories it can be inserted under since, in formulating lexical representations, the concern has been with their syntactic rather than their semantic properties. The meanings of words were considered of minor significance as long as the right lexical items were inserted under the right grammatical categories.

Most attempts to characterize lexical meaning which have been proposed, involve some kind of feature analysis where the meaning of a word is described as a constellation of features or components; the linguistic technique designed for this task is called componential analysis. Structural linguists first formulated the techniques of componential analysis, but the notion of decomposing lexical meaning has also been adopted by some generative linguists (Katz & Fodor, 1964; Chomsky, 1965).

Componential analysis, as it is presented here, was first practiced by North American anthropologists in describing the kinship systems of various cultures. It is interesting to note that the anthropologists adopted a procedure developed by Z. Harris (1948/1966). He used a componential approach for the analysis of portmanteau morphemes which constituted a problem for early structural linguists whose theoretical assumptions demanded that each morpheme be associated with a unique meaning; this is not the case with the portmanteau. Latin case endings are an example of portmanteau morphemes since they combine information about case and gender in a single form. Harris suggested that portmanteau morphemes should be analyzed as having two or more submorphemic components. Anthropologists (Lounsbury, 1956; Goodenough, 1956) realized that this technique could be applied to some of their problems in studying kinship systems and folk taxonomies. Thus, componential analysis actually arose out of an attempt to systematize grammatical analysis and this structuralist point of view was inadvisedly imposed on meaning.

The analysis of kinship systems using componential analysis appeared quite successful; the components corresponded to the biological facts about interrelationships of individuals, and anthropologists could determine how the biological relationships were integrated into the social structure of a culture. The analyst had only to discover which sets of biological relationships were covered by a single lexical item and he could assume that he had described the social meaning of that kinship term. In Pawnee, for example, the term *tatiraktaku* is roughly translated as "my wife", but is applied to all of the following relationships; mother's brother's wife, one's own wife, wife's sister, brother's wife, father's brother's son's wife, and mother's sister's son's wife. A man has certain social and cultural obligations to all of the individuals he calls *tatiraktaku* (Lounsbury, 1956).

Success with kinship terms suggested that componential analysis could be applied to other sets of words. Bendix (1966) analyzed a set of *have* verbs from what he called the "General Vocabulary" of English, Hindi, and Japanese; some examples are, *lose*, *own*, *buy*, *sell*, and *find*. Bendix's study illustrates a subtle shift in the approach to componential analysis. In the studies with kinship terms, the components were predetermined because they were based on biological facts and geneology, but in the analysis of a set of words such as Bendix's *have* verbs, the nature of the components has changed in that they are determined by the intuitions of the analyst. The researcher is in the position of describing the vocabulary of a language without a clear idea of how other language users might relate lexical items to the real world (Burling, 1964; Fillmore, 1975a; Wallace, 1965).

Word meanings are of different types and knowledge about how a word is used to describe the real world is as much a part of its meaning as knowledge of its function in the linguistic system of a language. The problem in componential analysis is deciding which aspects are linguistic, and therefore encodable as features, and which are part of encyclopedic knowledge, and therefore outside the domain of linguistics.

Semantic components may only be another of those "convenient fictions", a possibly useful way of organizing the lexicon of a language, but they do not necessarily correspond to any psychological reality. But, what *is* meaning if it is not psychological? One apparently objective method for determining components is to rely on scientific descriptions of the objects and events referred to by words, as in the analysis of kinship terms. Such an approach is attractive to structural linguists because the analysis of meaning can be presumed to be objective, and Bloomfield's theory of meaning is maintained. The major difficulty with the scientific analysis of meaning is that the language user's interpretation of a word does not always correspond to the scientist's description of the word's referent. Nida (1975) gives the example of *walk* versus *run*. A naive person will say that the difference between these two meanings is in terms of speed, *run* is a faster action than *walk*.

> When confronted, however, with the fact that some persons can walk faster than others can or do run and that stationary running involves no movement in space, they readily admit that speed is not the determining factor. (Nida, 1975, p. 21)

Nida concludes that the relevant feature must be whether one or both of the feet are always in contact with the ground (*walk*), or neither foot is (*run*) and, as a good structuralist, he opts for what he thinks is the scientifically correct rather than the psychologically real description. Such analytic descriptions are useful and important but do not necessarily help the semanticist determine the meanings of a word within a linguistic community. Such descriptions cannot be considered equivalent to word meanings if language users do not refer to the concepts included in the analysis when they use a word.

One attempt toward making lexical features more psychologically real was to hypothesize that the semantic components were universal semantic primitives. It is assumed that the primitives are the smallest unanalyzable meaning components of a language, although they are usually designated by labels which are ordinary words in the language being analyzed, for example, MALE or ANIMATE. It is stressed by proponents of semantic primes that these features are "... abstract theoretical entities representing complex psychological mechanisms. Their names must not lead us to the impression that they are themselves lexical entries of any natural language" (Bierwisch, 1970, p. 182).

A problem with this approach is that there is no method for deciding when the proper set of semantic primitives has been found. Most of the primitive concepts mentioned in the literature can themselves be broken into smaller components. For example, HUMAN, a frequently proposed primitive component, can be further represented as FEATHERLESS, BIPED, RATIONAL, etc. (Leech, 1974, p. 99). The semantic complexity of a lexical item can be varied depending on which set of components is chosen to represent its meaning (Fillmore, 1978).

Not all lexical meanings can be characterized as a set of discrete components. Some meanings are inherently relational such as *have*, which links an individual with an object (Bendix, 1966). Weinreich (1966a) has suggested that relational meanings of lexical items could be represented by structured sets of components.

This idea was incorporated into generative semantics which carried the notion of lexical decomposition to its most extreme limit. Instead of simply hypothesizing that the meanings of lexical items could be represented by semantic primitives, it was assumed that the syntactic deep structure of a sentence is the same as its semantic representation. The terminal elements of the deep structure are semantic primitives chosen from a universal set. Various transformations are performed on these trees in the course of their derivation, and special configurations of the semantic primitives can be replaced by a lexical item if there is an appropriate one available in the language. The rather bizarre example often used to illustrate this concept is the structured set of features CAUSE-BECOME-NOT-ALIVE which can be replaced by the word *kill* (McCawley, 1968b).

Semantic representations of this type are used by the generative semanticists to relate two semantically synonymous but syntactically different sentences such as the following:

a. The party was a success.
b. The party succeeded.
(Fodor, 1977, p. 74)

In the standard version of transformational-generative grammar these two sentences would have different syntactic representations with perhaps similar semantic interpretations; in generative semantics, on the other hand, these sentences have the same underlying structure. They only differ in the transformations applied in their derivation. The thrust of generative semantics is to reduce semantics to syntax, thereby neatly solving the linguists' problems in attempting to limit the scope of semantics. Generative semantics represents one logical extreme of a feature type analysis, which is to make lexical features entirely syntactic, thereby eliminating semantics from grammar.

A common assumption often, but not necessarily associated with the decomposition of lexical meaning is that all features are binary, that is, either present or absent. It is not clear why some analysts have insisted on this point since one could have a non-binary componential analysis just as well as a binary one. It is, perhaps, the example of distinctive features in phonology which has been overenthusiastically extended to lexical meaning in an attempt to make the description of the lexicon look systematic. Binary semantic features may be present within restricted sets of terms, for example MALE in kinship or pronoun systems, but if the binary constraint is combined with the minimal definitions principle, one gets a situation where every meaning would have to be specified as either plus or minus MALE, even in cases where this feature is quite irrelevant or inappropriate. For example, MALE is not a part of the meaning of *rock* or *thinking*.

Binarism implies a notion of semantic markedness since, to choose a particular feature suggests that certain semantic oppositions are marked in a language. The difficulty is that semantic oppositions are not always consistently marked throughout a language. In English, *vixen* is marked +FEMALE in relation to *fox*, and although *woman* could be considered similarly marked in relation to *man*, *girl* is certainly not obviously marked when compared to *boy*. In addition, it is not always the female member of a pair which is marked since *drake* is marked +MALE in relation to *duck* (Lyons, 1977, p. 322). In order to maintain a binary system either MALE or FEMALE must be arbitrarily chosen. Both features could be incorporated into a semantic analysis of English animate beings, a solution which seems to better represent English lexical semantics, but is contrary to the whole notion of a binary semantic system.

Binary features cannot express the differential salience which some meaning components can have for various language users. Furthermore, some highly salient features may not be general so that they only apply to one specific lexical item. *Assassinate*, for example, might have the feature FOR POLITICAL MOTIVE, which is salient for this word but few others (Lehrer, 1974). It is also possible that two synonymous or nearly synonymous words can have the same features but differ in intensity, *mammoth* is like *big*, only more so (Nida, 1975). Strict binary features cannot show degrees of intensity and the analyst must either propose an additional feature such as INTENSE, or use a superscript system where if *big* is +HEIGHT and +BREADTH, *mammoth* is $+^2$HEIGHT and $+^2$BREADTH, or some other non-binary notational devices (Nida, 1975; Nida et al., 1977). The difficulties with binary features are further compounded by the fact that not all contrastive sets of lexical items can be conveniently described by them. As already noted in Chapter 1, some sets of words have a dimensional structure, and lexical sets such as days of the week or months of the year are cyclical.

Fodor, Fodor, and Garrett (1975) argue against lexical decomposition. They point out that the complexity of sentences would have to be determined by the complexity of their lexical items, so that "John is a bachelor" should be more semantically complex than "John is unmarried." The first sentence does not appear to be semantically more complicated than the second, and Fodor et al. note that the definitional and psychological complexity of these two sentences do not correlate.

They opt for meaning postulates as a method for representing the semantic content of utterances. It is difficult to see how this solves the problems encountered by lexical decomposition. How can the entailments of a sentence be determined without understanding its meaning? The interpretation of an utterance crucially depends on an understanding of its component lexical items, since these are the linguistic devices which indicate what is being talked about.

Decomposing a sentence into its logical form is really not much different from decomposing it into features. True, logical form is better able to show relations among elements but the message is still being divided into definitive components. Theories of logical form and componential analysis both assume that the meanings of utterances can be determined in isolation, simply by analyzing the intra-sentential components.

Selectional Restrictions

Lexical decomposition was used by generative grammarians to block the derivation of semantically anomalous sentences. Each lexical item was marked with its selectional restrictions, which were thought to be those aspects of lexical meaning determined by linguistic rather than psychological factors (Chomsky, 1965; Katz & Fodor, 1964). Since native speakers judged semantically anomalous sentences as unacceptable, generative linguists considered it crucial for their grammars to account for semantic anomaly. From a language user's point of view, however, detection of semantic anomaly is not systematic and linguistic. Rather, it occurs when a hearer realizes that the utterance presented to him for interpretation does not correspond with what he knows about reality, or that it is simply inconsistent with the expectations established by the communicative situation of the moment. For almost every anomalous example thought up by a transformational-generative linguist, an appropriate context either linguistic or situational can probably be constructed for which the utterance makes sense.

In the Aspects model, Chomsky held that each lexical item was marked with features such as +/-HUMAN or +/-ANIMATE. Lexical items with incompatible feature specifications could not be combined, so that it was impossible for the grammar to derive anomalous sentences. In this model, semantic deviance was considered a syntactic rather than a semantic problem, and the lexical features were a special kind of grammatical category. Chomsky (1965) explicitly rejects handling selectional restrictions by the semantic rather than the syntactic component of his grammar.

Katz and Fodor (1964) developed a theory which uses the semantic component to prevent sentences which violate selectional restrictions. In their model the meanings of words are expressed in terms of two kinds of features, semantic markers and distinguishers. The markers encode the part of lexical meaning systematic for language and the distinguishers are used for the residual or idiosyncratic aspects of individual words. One goal of lexical semantics ought to be the discovery of those features which are inherent or central to the use and understanding of a word. Markers and distinguishers attempt to do this, but in addition, markers express the selectional restrictions involved in the combination of certain lexical items.

For example, semantic markers would block the utterance "He painted the walls with silent paint". The words *silent* and *paint* are assumed to have incompatible semantic markers in their dictionary representations; let us say that *paint* has the feature -NOISE.[2] This feature is not an inherent or salient property of *paint* but merely a marker added to its lexical representation to prevent the supposedly inadmissible combination, *silent paint*. The rules of semantic interpretation would then block the anomalous sentence from ever receiving a semantic representation. Unlike the Aspects model, anomalous utterances could be derived by the syntactic component, but they were prevented from becoming acceptable sentences by the semantic component.

The distinction between markers and distinguishers presents difficulties for the Katz-Fodor theory. It is not clear what this dichotomy is supposed to represent other than a weak attempt to systematize meaning. Bolinger (1965) has shown that all distinguishers can be elevated to the status of markers since information contained in them may be necessary to prevent anomalous or ambiguous readings, the usual function of markers. Bolinger also points out that the marker-distinguisher distinction does not correspond to anything in the real world or in natural language. Katz attempted to preserve the two types of features by assigning to distinguishers the function of indicating perceptual differences among referents, while markers represent conceptual components of sense (Katz, 1972). Stated in these terms the distinction no longer separates linguistic from non-linguistic meaning, the original purpose of formulating selectional restrictions. Jackendoff (1981) notes that the anomaly of "That man is pregnant", is the same as "That person is pregnant", if the person referred to is in fact a man. Why should the first case be considered a violation of linguistic criteria, while the second example only violates pragmatic knowledge? It is difficult to maintain a formal distinction between linguistic meaning and real world knowledge as Katz has attempted.

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[2] The postulation of a feature -NOISE for *paint* does not agree with the usage of such terms as *loud* and *muted* with colors and, presumably by extension, to *paint*. This illustrates once again, the complete inability of the Katz-Fodor model to incorporate even the most common metaphors into their description of lexical semantics (cf. Weinreich, 1966a).

Many arguments have been presented against selectional restrictions. McCawley (1968a; 1971) and Jackendoff (1972) have suggested that sentences which violate selectional restrictions must be interpreted because sentences such as, "It is nonsense to say he painted the walls with silent paint" are well-formed. Chomsky's Aspects model never allowed for the generation of such sentences, while the Katz-Fodor model generated such sentences but prevented them from receiving a semantic interpretation. McCawley and Jackendoff would contend that, in some sense, language users have to understand sentences which violate selectional restrictions in order to know that these utterances express information incompatible with the way the world operates.

The Katz-Fodor account of selectional restrictions excludes real world knowledge as a possible source of judgements about semantic anomaly. In their theory the dictionary is supposed to encode all possible selectional restrictions which might hold among lexical items. The dictionary entries would also have to systematically encode everything an individual knows about the world, which would make them extremely long, possibly infinite.

A formalization of selectional restrictions was another attempt to force those aspects of the cognitive system which impact on language into the more narrowly formulated grammatical system. It was noted above that holding a view of autonomy of syntax will not lead to a useful description of linguistic processes (see also Derwing, 1980; Derwing & Baker, 1978; Hormann, 1981; and Prideaux, 1980), since syntactic devices convey information about the relationships among the components of an utterance. Autonomy of semantics also cannot be maintained because hearers refer to pragmatic variables as well as grammatical structures when they interpret utterances.

Lexical Relatedness

The obvious productivity of certain morphemes was another aspect of lexical items which presented problems to the generative grammarians. Creativity was supposed to occur only at the level of syntax, while lexical items were considered to be indissoluble units passively waiting to be utilized by the syntactic component (Jackendoff, 1975). Experimental evidence has shown that this is not the case. Word formation can be a creative process, at least for certain productive derivational morphemes (Derwing & Baker, 1977; 1979).

Linguists had to develop a notion of lexical relatedness in order to explain lexical productivity. Lexical items can be related through their meanings and through shared morphemes. Linguists are usually more concerned with forms than meanings, therefore, linguistic notions of lexical relatedness hinge on shared morphemes. For example, *king* would be considered related to *kingly* and *kingdom*, but not to *sovereign*. The next chapter shows that psychologists were interested in lexical items which are semantically but not necessarily, morphologically related.

Two approaches to characterizing lexical relatedness have been proposed within the generative framework; the transformationalist hypothesis, and the lexicalist hypothesis. The transformationalist hypothesis is closely linked to generative semantics. Related lexical items are represented by the same or similar semantic primitives in deep structure, since they are considered to have similar meanings. The related forms have different surface structure representations because they have undergone different transformational histories. In this theory the lexicon is a series of forms which are inserted into trees by transformations after certain other transformations have applied. Relatedness of meaning is therefore not an important function of the lexicon, but is mainly represented through the derivational history of syntactic structures.

The lexicalist position as expressed by Chomsky (1972), states that relatedness is not derived through transformations. Rather, relatedness is expressed through lexical redundancy rules. Related words such as *decide-decision* have a single entry in the lexicon representing their common meaning. When lexical insertion takes place the lexical redundancy rules derive the correct grammatical form for the syntactic slot available.

Jackendoff (1972; 1975), in general, accepts the lexicalist position, although he has some criticisms of Chomsky's (1972) version of it. Jackendoff notes that both Chomsky's version and the transformationalist hypothesis would require hypothetical forms such as **auth* as the base for *author*. These nonexistent entries would then have to be specially marked with a feature indicating that they are nonoccurring. As an alternative, Jackendoff (1972; 1975) proposed that each actually occurring word of a language be entered into the lexicon. Redundancy rules within the lexicon would state which items are related. These redundancy rules would account for productivity, since they are formulated from observed generalizations and, once acquired, the rules can be used for new forms. Jackendoff's theory eliminates the neccessity of proposing hypothetical base forms, but it does not really explain how people can use derivational morphemes productively with nonsense forms since there would be no entry in the lexicon for the redundancy rule to operate on.

None of the positions described above would serve as a psychological model of the lexicon. It is possible that for language users, semantic relatedness is more significant than morphological relatedness, although morphological relatedness is important for acquiring the productive rules of word formation. Both aspects of lexical relatedness should be considered, not exclusively one or the other.

Variability of Lexical Meaning

The lexicon is essentially a list of linguistic devices used to denote the entities available as topics of discourse. The items in the lexicon can be as varied as human experiences in the world since we have a wide variety of things to talk about. Much of the thrust of semantic theories within generative grammar has been to attempt to systematically formulate the elements of the lexicon. The autonomy of syntax hypothesis demanded that those semantic variables which affect the forms of utterances be formalized as part of the grammar. Linguists are begining to realize that there are many aspects of language which cannot be systematically described. A trend in current linguistic thinking is toward explaining the unsystematic aspects of language lexically, in an effort to constrain the power of grammatical rules (Brame, 1981; Newmeyer, 1980).

Many linguists have recognized that the meanings of words are far from invariant (Fodor, Fodor, & Garrett, 1975; Aronoff, 1981; Nida, 1975; Bolinger, 1973; Lehrer, 1974; Fillmore, 1975a; 1978), but they have not fully understood the implications this has for a theory of language. The way to incorporate variability into a theory of meaning is not to attempt to develop a linguistic semantics but rather to explain meaning as a function of human communicative abilities. Variability arises because language is a part of human cognition. No two people have exactly the same picture of the world, and the success of any attempt at communication will depend on the extent to which the individuals involved have had similar experiences. One has only to consider the Soviet and American views of *democracy* to realize that words can have variable meaning.

Language is the medium usually chosen for communication. Therefore, the link between meanings and linguistic devices must be flexible enough to accomodate the varied experiences of language users. At the same time, however, the use of lexical meanings must be conventionalized, otherwise communication would be impossible.

Every utterance *must* be interpreted. Interpretation would be unnecessary if meanings were fixed since each linguistic expression could have only one predetermined definition. If meanings were invariant, sentences, the objects studied by linguists, would convey meanings. The interpretation of a sentence would involve a simple concatenation of the meaning of each of its component parts. Every instance of a particular sentence would always have the same meaning regardless of the context in which it occurred. It would then be necessary to have many more sentence forms, one for each different contextual interpretation. This is not the case for human languages, however; sentences are meaningless until they are placed in a particular context and interpreted by a particular hearer as an attempt by a particular speaker to communicate a message.

There are three sources of variability in meaning which involve cognitive abilities of interpretation and real world knowledge: 1) connotation, 2) contextual dependence, and 3)creativity. Each of these is discussed in turn.

In addition to their referential properties, many words have an emotional or connotative component which is extremely variable from person to person. A word like *dog* may have a different impact for someone who has been severely bitten by one than for a person who has always had "man's best friend" as a companion. Linguists have avoided including connotative information in their semantic representations and in the case of a word like *dog* this may be justified since the referent can be identified regardless of one's feelings. The connotative component of a particular individual's concept of dog is based on his personal experiences and is not usually encoded in the conventional meaning of *dog*.

Some words, however, have a connotative value as an integral part of their conventional meaning, such as *knock off*, a synonym of *kill*. When linguists encounter such lexical items they tend to assign the connotative value to stylistics and then forget about it. The connotative value of these kinds of words is usually learned from contact with the words themselves rather than their referents. This example plus the one in the preceding paragraph illustrates that one type of semantic component, connotative value, can have an idiosyncratic as well as a conventionalized representation. The conventional interpretation is most closely associated with what is generally called linguistic meaning.

The interpretation of word meanings may vary with context, either situational or linguistic (Fillmore, 1975a; 1978). A simple example is the word *glue* which is interpreted as a substance in the linguistic context "They found the ___" and as an action in the frame "They ___ the pieces together." Context can also be instrumental in determining the connotative value associated with a word. The normally neutral word *cow* has a highly emotional charge in the utterance "That woman is an old cow."

In a previous section it was mentioned that contextual dependence of lexical meaning makes componential analysis difficult. The linguist has but to assume that he has completely specified the meaning of a word, only to find it used in such a way that an additional feature seems necessary. It is also impossible to list the selectional restrictions which apply to a lexical item since the utterances which appear to be semantically anomalous in isolation will be perfectly acceptable in an appropriate context. The anomalous example presented earlier, *silent paint*, could be made sensible in a context such as the following: "Since vibrant colors were considered too loud, he painted the walls with silent paint", implying that dull or washed out colors were used.

When a language user encounters an utterance, he attempts to interpret not it, so much as the speaker's intentions in formulating it by using his knowledge of his linguistic system, *and* his experiences with similar utterances in similar contexts. Emphasis on the importance of contextual information for the interpretation of words would seem to suggest that investigating the meaning of isolated lexical items ought to be impossible. Although the meaning of a word cannot be fully specified without considering the various contexts the word appears in, it is possible to study some of the potential meanings which a word suggests to language users. Native speakers have intuitions about the meanings of words, even words they do not ordinarily use. In a psycholinguistic experiment (Marckworth, Baker, Kawashima, & Mayadevi, 1981) upper caste, educated Kannada speakers were asked to rate the semantic similarity of some judging verbs (*praise*, *condemn*, and *criticize* are some English examples). Included in the stimulus list were "village" words used only by lower caste, uneducated speakers of Kannada; the experimental subjects could agree on the semantic similarity rating of these words even though they spontaneously said that they would never actually use such words in their own speech.

Variability of word meaning allows for the creative production and comprehension of utterances. Most linguists acknowledge the creative uses of language at the syntactic and discourse levels, but it has generally been assumed that word meanings are fixed and no creativity was expected at the lexical level. The use of metaphor, in particular suggests that this is not the case. Many linguists have usually excluded an account of the metaphorical usage of words from their theories because it is difficult to systematically describe both the conventional and metaphorical meanings of words.

People have a desire to communicate and if there is no readily available lexical item for the concept which a speaker is trying to express, he will invent one. In a technological society such as ours, new words are coined all the time, particularly as new inventions become a part of our everyday life. *Television*, *escalator*, and *microwave oven* are prime examples. In an experiment conducted by the author, reported in Chapter 7, subjects were asked to label a variety of different noises. The stimuli were recordings of bells ringing, whistles, thumps, and bangs. It was hoped that the results would produce conventionalized onomatopoetic responses, but this was not always the case. Many subjects gave idiosyncratic and creative labels, especially for noises where the source was not easily identifiable. The results of this study suggested that lexical creativity is an ability which speakers can tap when they do not have a readily available onomatopoetic word.

Conclusion

From a psycholinguistic perspective linguists have appeared to be unsuccessful in their attempts to describe formally lexical meaning in language. Many linguists have developed descriptions of individual lexical items but have been unable to carry through to a formal description of the entire lexicon. In many cases, however, linguists have been asking the right sorts of questions about lexical meaning. Their intuitive approach to analysis allows them to consider complex semantic relationships in detail. Such insights are often not a consequence of experimental studies since the researcher looks for the most general or common responses.

Much of the confusion about which (if any) aspects of word meanings should be represented in a grammar results because the lexicon does have some systematic elements which can be described by rules. For example, some derivational morphemes, such as agentive, usually add a fixed semantic notion to words. The lexicon is, at the same time, a list of vocabulary and therefore, not rule governed, since anything which must be learned as a list cannot be described by linguistic generalizations. One cannot say that the elements of the lexicon are entirely governed by grammatical rules, nor can one say that those elements are completely unsystematic and invariant.

Words are linguistic devices used to convey meanings in particular utterances. The interpretations of meanings are determined by real world knowledge and past experiences. The morpho-syntactic aspects of words can be formalized by grammatical rules, but a description of their meanings must be approached from a psychological perspective. The inadequate representations of lexical meaning suggested by various linguistic theories show that an entirely formal approach won't do. The next chapter reviews some of the difficulties psychologists have encountered in their attempts to understand lexical meaning.

CHAPTER 3

EXPERIMENTAL INVESTIGATIONS OF LEXICAL MEANING

Introduction

The last chapter reviewed linguists' attempts at developing a theory of word meanings; this chapter discusses psychologists' efforts to study lexical meaning experimentally. Unlike linguists, psychologists were not generally interested in discovering the structural properties of the lexicon which impact on syntax. Experimental research is oriented toward discovering the mental representation of lexical items either in themselves or in terms of the concepts labeled by them. Usually, the assumption is that the meanings of lexical items are either represented as sets of features or ordered as a function of continuous underlying dimensions. Like linguists, psychologists have generally assumed that word meanings are static and there is an invariant set of features or dimensions associated with each lexeme. The experimental methods and data analytic techniques used have been influenced by this assumption.

The psychological studies discussed below did not generally result in theories of lexical meaning *per se*, but some of them illuminate important aspects of lexical semantics. The psycholinguistic studies reviewed in this chapter are: Osgood's semantic differential and semantic interaction technique, Rosch's category prototypes and basic objects level, Deese's inter-item associations, and semantic similarity judgements. The discussion in each case concentrates on the important theoretical issues associated with each method rather than the details of experimental procedures and data analysis.

Psychologists, like linguists, defined different types of meaning and then attempted to study the one which they considered particularly relevant to their discipline (Osgood et al., 1957; Clark & Clark, 1977; Smith, 1978). The following quote from Szalay and Deese (1978) is a typical example of this attitude:

> Psychological meaning describes a person's subjective perception and affective reactions to segments of language. It characterizes those things that are most salient in an individual's reactions and describes the degree and direction of affectivity. In comparison, rational or philosophical meaning describes the abstract characteristics of the referent and its relation with other conceivable referents, while lexical meaning describes the dyadic

> relations between words and referents.
> (Szalay & Deese, 1978, p. 2)

All meaning is a product of human minds and should be of concern to psychologists. It is therefore surprising that they would be willing to limit their attention to one small part of human cognition, namely affective reactions, although this may in part be due to the lack of an adequate theory of human cognition. It was seen in the last chapter that many linguistic theories of lexical meaning are inadequate because they do not allow for psycholinguistic variables; many psychological theories also fail because they do not consider the individual mind as a unified whole. They attempt to ignore such variables as syntactic function, past experiences, and word-referent relationships. These so-called contaminating variables are significant components of meaning. Their influence in psychological studies may be experimentally controlled or accounted for if the researcher is aware of their potential impact on the subjects' interpretation of linguistic stimuli. If linguistic variables are ignored, the researchers may not actually be measuring what they claim they are.

The Semantic Differential

It would be difficult to exaggerate Charles Osgood's contribution to lexical semantics; his semantic differential technique (Osgood, Suci & Tannenbaum, 1957) has been a standard research tool for twenty years. When the inadequacies of the method became apparent, Osgood devised another approach for discovering components of meaning, the semantic interaction method (Osgood, 1970). Both types of research are discussed in this section, but more attention is paid to the semantic differential since it has received more comment from linguists (Weinreich, 1958) and psychologists (Brown, 1958a; Carroll, 1959; Bousfield, 1961) than semantic interaction studies.

The semantic differential consists of a set of bipolar adjective scales which subjects use to rate concepts such as *mother*, *tornado*, *boulder*, *Senator (Joseph) McCarthy*, or *my boss*. The ratings are factor analyzed for a set of terms in order to determine the salient dimensions underlying the set of concepts rated. The reader is referred to Osgood, Suci, and Tannenbaum (1957) *The Measurement of Meaning*, and Snider and Osgood (1969) *Semantic Differential Technique: A Sourcebook*, for more details about the method of analysis and experimental procedures.

Osgood's early conception of lexical meaning was firmly rooted in the traditions of behaviorism and associationism, although he differed with his fellow psychologists in both schools by insisting that meaning is worthy of investigation (Osgood, 1961). Compare this attitude to Bousfield's (1961) statement:

> It seems to me that meaning is not only an unnecessary concept for verbal learning but a concept bound to lead to confusion. Like the concept of emotion it is ambiguous, and it is tied up with philosophical considerations going beyond the domain of psychology. (Bousfield, 1961, p. 81)

Osgood and his colleagues claimed they were measuring affective or connotative meaning, the internal responses evoked within a subject when he encounters a particular linguistic sign. Affective meaning is opposed to denotative meaning which is the relation between a referent and the word which represents it (Osgood, 1959). It is argued below that the semantic differential can be used to measure both types of meaning, and that the apparent affective responses were a result of experimental procedures.

The mediation theory of meaning developed by Osgood (1963, 1964, 1966b) is not disconfirmed or confirmed by evidence from semantic differential studies, an unusual occurrence since most psychologists propose elaborate theories to explain subject behavior on one type of task. In fact, Osgood's theory appears to have little to do with the main body of his research efforts, but it is briefly reviewed here to illuminate his theoretical orientation.

According to Osgood the meaning of all signs can be attributed to mediating representational processes which are formed as a function of people's experiences in the real world. The mediating process describes the link between the internal representation of an object or event and the object or event as it occurs in the real world.

Semantic differential results are explained by considering the representational mediations as bundles of responses corresponding to the emotional impact of the sign as reflected in the semantic differential scales. These representational response bundles are combined with each other in various ways to represent different reactions toward concepts. The mediation bundles are like the componential features discussed in the last chapter. In Osgood's early version of the theory, however; the components are internal psychological states rather than linguistic elements and, these states define the semantic space of an individual (Osgood et al., 1957). Osgood does not claim that denotational meaning is not an important semantic element, but he considered it a philosophical, not a psychological problem (1959) and therefore not susceptible to experimental investigation. It is unlikely, however, that Osgood maintains the same point of view toward denotational meaning today that he did twenty years ago.

It was initially thought that the semantic differential technique would reveal all the dimensions of semantic space if only a representative set of concepts were rated on the proper set of scales (Carroll, 1959; Osgood, Suci, & Tannenbaum, 1957). Osgood's characterization of semantic space is described in the following excerpt.

> My original "vision of a concept-studded space was refined to specify an *origin* or neutral point of the space, defined as "meaninglessness" (analogous to the neutral-grey of the color space), and to conceive of meaningful concepts as the end-points of *vectors* extending into this space, with lengths of the vectors indicating degrees of "meaningfulness" (like saturation in the colorspace) and their directions indicating the "quality of meaning" (analogous to both brightness and hue dimensions of the colorspace). (Osgood, 1976, p. 5)

Osgood's characterization of the interrelationship of concepts implies that semantic space is a stable, quantifiable entity waiting to be mapped; we just have not yet found the proper means of measuring it. Particularly inappropriate in Osgood's characterization of a semantic space is the meaningless center which is used to gauge the distances among concepts in the space. Semantic representations must exist in the minds of language users and it is inconceivable that the mind should contain a meaningless core. The description of semantic space quoted above is a characterization of the factor analysis performed on semantic differential ratings. It is always tempting to interpret the results of multivariate analyses as the actual representations of mental structures, but multivariate statistics are not windows into the mind; they produce results consistent with their own mathematical basis and are entirely dependent on the numerical properties of the data analyzed. The data are provided by subjects who obviously use their minds to perform the tasks assigned to them, but at most, multivariate analyses can reflect possible mental structures only in a very indirect way.

It is now apparent that the semantic differential could never be used to map the entire semantic space of an individual, and its usefulness as a "measurement of meaning" is restricted in several ways. Some of the early criticisms (Brown, 1958a; Carroll, 1959) pointed out that in their application of the method, Osgood and his associates only asked subjects to rate *nouns* on bipolar *adjective* scales. Not all concepts can be characterized by bipolar oppositions and not all oppositions are necessarily adjectival; *come-go*, *ever-never*, and *mountain-valley* are other possible contrasts on which to judge concepts (Carroll, 1959).

The semantic differential is extremely sensitive to a subject-by-concepts-by-scales interaction; concepts such as *me* or *my boss* will, of course, be rated differently by different people. This facet of the semantic differential enabled Osgood and Luria (Osgood, Suci, & Tannenbaum, 1957) to analyze the three different personalities of a patient in psychotherapy. The manner in which a concept is rated will also depend on how a subject interprets the stimuli.

In spite of the subject-by-concepts-by-scales interaction, the early semantic differential studies produced quite consistent results. The three dominant dimensions from the factor analyses of a great many studies were Evaluation (*good-bad*, *pleasant-unpleasant*), Potency (*strong-weak*, *large-small*), and Activity (*sharp-dull*, *active-passive*), with Evaluation by far the most prominent. It was suggested that these three dimensions represented the bases of human cognition, although it was realized that the semantic space must contain many more as yet undetermined dimensions.

The consistent recurrence of these three dimensions was not a consequence of fundamental cognitive abilities, as originally supposed, but rather resulted because subjects were forced to interpret the scales metaphorically for many of the concepts (Brown, 1958a; Carroll, 1959; Osgood, 1976). For example, *boulder* can only be rated as *sweet-sour*, or *tornado* as *fair-unfair* if these scales are *not* interpreted as designating denotative aspects of the concepts.

> The pressure toward metaphorical usage of adjectival terms means that most scales used with most concepts will *rotate* in the semantic space toward that affective feature on which they have their dominant loading *sweet-sour* toward E, *hard-soft* toward P, *hot-cold* toward A. Since, in factor analysis the major dimensions are mathematically inserted through the largest clusters of variables, this means that the shared affective features E, P, and A will be amplified and the many subtler denotative features of meaning damped.
> (Osgood, 1976, p. 90)

It is possible to surpress the Evaluative, Potency, and Activity factors by restricting the semantic differential task to a single semantic domain. The scales will then be interpreted denotatively in a consistent manner for all concepts in the set. Osgood (1976) reported that Kuusinen's analysis of the ratings for Finnish personality terms produced six personality factors: Trustworthiness, Self-righteousness, Rationality, Predictability, Tolerance, and Sociability. The Evaluative, Potency and Activity factors did not result from the analysis because the subjects were able to interpret the scales denotatively rather than metaphorically.

When the concepts are taken from specific semantic domains, the rating scales must also be chosen so that they represent potential features common to the entire set of words. If a scale is ill chosen, it will not usually be given a metaphorical interpretation as in the tasks with heterogeneous concepts but, rather, will receive neutral ratings, and will not significantly load on any of the factors. In a study of words used to designate noises, reported in Chapter 7, the present author used the semantic differential technique to obtain ratings of noises and also of the words which referred to those noises. Logical denotative scales for this study were *loud-soft*, *high-low*, and *brief-continuing*. The pair *warm-cool* was also included since this scale usually has high loadings on the Activity factor, but in the factor analysis of the noises semantic differential data, where the scales were being interpreted denotatively, the *warm-cool* scale did not load on *any* of the five factors found. This result suggests that the semantic differential can be a tool for measuring denotative meanings as well as affective reactions.

The semantic differential has not lived up to its initial promise of evolving into a predetermined set of scales against which any and all concepts might be measured and compared, and it is apparent that the analysis of lexical meaning should generally be restricted to one domain at a time. The semantic differential thus requires a certain amount of *a priori* intuitive analysis of a lexical domain in order to decide which scales are appropriate for which fields. The semantic differential technique is ideal for validating presumed meaning components discovered by other methods, some of which are discussed in this chapter. The hypothesized features could be used as rating scales in a semantic differential task. If the groupings of the concepts from the semantic differential matches those found by earlier analyses, the researcher can assume that he has found salient meaning components for a particular lexical field. Osgood and his associates did not use this method for validating the proposed dimensions underlying the semantic differential, although this approach was used for some of the semantic interaction studies discussed in the next section. In the early days, the factors resulting from an analysis of semantic differential ratings were labeled and it was then assumed that these labels represented the underlying psychological variables without further validation.

Semantic Interaction Technique

The inadequacies of the semantic differential as a measurement of meaning did not induce Osgood to abandon his "explorations of semantic space." In true pioneer spirit, he devised another technique for studying lexical meaning using semantic interactions in the syntagmatic combinations of lexical items such as adjective-noun, or verb-adverb (Osgood, 1970, 1976), a first timorous step for psychology from words toward language.

Osgood has assumed that all word meanings can be described by a set of features which may have +, -, or 0 values for each concept. The features appropriate for encoding the meaning of a concept are postulated on the basis of an intuitive analysis of a lexical field, in much the same way that linguists approach lexical meaning. Osgood finds nothing unscientific about an intuitive analysis of meaning as long as the *a priori* features are verifiable in subsequent experiments. Osgood (1970) reports one experiment where the predetermined features were used as scales in a semantic differential rating task, and the resulting analysis corresponded to his *a priori* one.

When the feature codes for two words come together, three situations can arise: 1) *semantic anomaly*, the two codes have opposing values for some feature; 2) *semantic appositiveness*, the two codes have the same value on a particular feature, so that the meaning of that feature is intensified; 3) *semantic permissibility*, one or both of the codes contain a zero for the same feature so that no conflict or intensification occurs. In a typical semantic interaction experiment, a set of words is combined with another syntactically related set of words, such as verbs with adverbs, or pronouns with verbs, and each combination is judged for anomaly, appositiveness, or permissibility. The items which can fit in exactly the same frames are grouped together under the assumption that they have meaning elements in common.

The semantic interaction technique is very similar to the selectional restrictions analyses discussed in the previous chapter and, unfortunately, it shares many of the same difficulties for discovering lexical meanings. It is impossible to make adequate judgements about the semantic appropriateness of two or three word combinations presented in isolation. Osgood (1970) has found several disagreements between his own judgements and those of his subjects.

Judgements of this sort are context dependent, and also dependent on the imagination of the raters. They cannot be successfully used as a discovery procedure in lexical semantics. The fundamental flaw in studies such as these is the assumption that the subjects will react only to the stimuli presented. What they actually do is to try to find potential contexts in which the combinations might make sense.

An implication of the semantic interaction technique is that there is one set of features appropriate for all words since there must be matches or mismatches of codes in order for semantic judgements to be made. The *a priori* semantic analysis, however, is restricted to a particular lexical field, and the features discovered are relevant to the domain under consideration. Only gross grammatical (noun-verb) or semantic (concrete-abstract) features can distinguish among fields. There appears to be a contradiction someplace and the confusion on this point seems to be of exactly the same nature as that of the linguists who tried to complete a componential analysis of the entire vocabulary of a language using a small set of features.

The interaction of word meanings in utterances is an important problem for psycholinguistic research to consider. Unfortunately, none of the methods devised to study it have been able to quantify semantic interactions. In order to do so, a method must be devised which takes linguistic and environmental context into consideration. Only in this way can the processes involved in the interpretation of meanings be studied. Osgood's attempts to discover semantic interactions failed because he did not present subjects with contextual information to constrain their interpretations of the two word utterances. Since the subjects are free to invent an appropriate context, the experimenter has no method for determining on what basis judgements were made.

These criticisms of the semantic interaction method are in no way an attempt to diminish the value of Osgood's research into lexical semantics. He has been an innovator in this area for over twenty years and continues to provide valuable insights into the study of meaning.

Categorization Studies

The work of E. Rosch and her colleagues (1975a;b, Rosch & Mervis, 1975; Rosch et al, 1976; Rosch, Simpson, & Miller, 1976; Mervis & Rosch, 1981) has primarily been concerned with the manner in which perceived organization in the real world interacts with linguistic categorization. The categories studied have been those for concrete objects and it has been assumed (Rosch et al., 1976; Rosch, 1978) that the structure of these categories is in part culturally determined and in part a function of general human cognitive abilities.

Two important principles have been discovered as a result of Rosch's work, prototypicality and the "basic objects" level of a category hierarchy. Rosch (1975c, 1978) has argued that determining category membership is not a function of a set of criterial features where all category members have all the defining features and non-members do not; rather, categories are structured in such a way that a few members are clear cut exemplars with other items varying in the degree to which they belong in a particular category. *Oranges* and *apples*, for example, are good fruit members while *coconuts* are not (Rosch & Mervis, 1975). The good exemplars are the category prototypes and have more semantic features in common with other category members than they do with non-members. One might think of categories as having a central, clearly defined core of elements with increasingly ill-defined edges as one moves outward from the core.

Rosch has conceded that use of the term "prototype" for the best category members has been somewhat unfortunate since it has led to the assumption that the prototype is one particular category member or a mental structure representing the average member. The "one entity" interpretation of prototype is found in philosophical literature but this was not Rosch's intended interpretation for the term and she clearly states that "by prototypes of categories we have generally meant the clearest cases of category membership defined operationally by people's judgements of goodness of membership in the category" (1978, p. 36).

Studies with category prototypes have found that deciding whether an object or event is a member of a particular category is not an all-or-none proposition (Coleman & Kay, 1981; Labov, 1973; Rosch & Mervis, 1975). Category membership is usually based on a set of essential attributes. An object may have some or all of these attributes and degree of category membership is determined by how many features a particular item contains. The more essential features an item has, the more likely it will be judged to be a good category member. This holds for both concrete (Labov, 1973; Rosch & Mervis, 1975) and abstract (Coleman & Kay, 1981) categories.

The other result of category studies has been information about the "basic objects" level in a linguistic taxonomy (Rosch & Mervis, 1975; Rosch et al., 1976). Rosch has assumed that "... in the real world information rich bundles of perceptual and functional attributes occur that form natural discontinuities and that basic cuts in categorization are made at these discontinuities" (Rosch, et al., 1976). The labels for basic objects maximize the attributes contained in the information bundles. *Chair*, for example, is a basic level object; its superordinate *furniture* refers to a class of objects and is too general for denoting particular objects such as a chair since there are many other types of furniture entirely different from chairs. According to Rosch it is usually not necessary to employ Such labels are more specific than necessary because the defining attributes of the subordinates are the same as for their basic level superordinate.

(Subjects react to the basic objects quite consistently; when asked to list attributes for superordinates (e.g., *furniture*), basic level objects (e.g., *chair, table*), and subordinates (e.g., *kitchen chair, easy chair; coffee table, diningroom table*) they gave more attributes for the basic level objects than for the superordinates and there was no significant difference between the number listed for the basic level objects and their subordinates (Rosch et al., 1976). The same results were obtained when subjects were asked to list their motor interactions with objects; the most detailed motor actions were given for the basic objects. In addition, an analysis of shape showed that basic level objects of the same type had the same general shape while an average shape for the superordinate was not readily recognizable.

The basic objects level may be the most useful level for talking about the world. If speakers always used superordinate terms communication would be difficult since any given superordinate, such as *furniture*, can often refer to several objects in the immediate environment. On the other hand, there is usually no need to give detailed descriptions when an object can be uniquely designated by a basic level word just as well as by a subordinate. In particular contexts, however, the basic level words may not be specific enough for designating a unique referent. Rosch (1978) makes the point that to a salesman in a furniture store each type of chair is different. In such contexts the basic level may shift one level lower so that *easy chair*, *kitchen chair*, etc. are the basic level objects, while items such as *red kitchen chair with casters* are the subordinates.

The basic level is that level of categorization appropriate for the most general contexts. The subjects in the basic levels experiments have to supply their own context and they naturally assume that the most general usage would apply. If the experimental context were restricted so that the basic level were inappropriate, as in a furniture store, the results would probably be different from those found by Rosch et al. (1976), and the basic level would be treated as the superordinate.

Rosch has been interested in discovering how bundles of attributes in the perceived world interact with the labeling of objects, but she has not consistently maintained the distinction between real world objects and the words which are the names of the objects. The basic objects described by Rosch (Rosch et al., 1976; 1978) are not really objects at all but rather the most commonly used *labels* for everyday objects. When the subjects were asked to list attributes for *chair* they were not considering a specific chair, but rather, the characteristics of most objects which can be labeled by the word *chair*. In the real world there are no basic objects, there are only different ways of talking about objects which vary in degree of specificity. Rosch seems to be aware of this problem and her use of the term "basic level of abstraction" (1978) is a more accurate description of the research results than basic level "objects."

Another problem with the notion of "basic objects" is that they are psychological constructs and not simply a result of information rich bundles in the real world as Rosch implies (Murphy, 1982). The environmental cues may exist but no concepts are represented until these cues are interpreted by someone.

The contribution to lexical semantics by Rosch and her co-workers has been considerable even though it has been restricted to concrete categories. The notion of category is basically the same as that of a lexical field described in Chapter 1. The research with prototypes has shown that fields are not delimitable entities and that membership is not all or nothing; there are degrees of belongingness and most lexical items can belong to more than one category depending on how the categories are determined.

The basic level of abstraction experiments provide insight into what people know about the objects labeled by words. When asked to list attributes or motor protocols for *furniture* or even *chair*, subjects do not have a specific object in mind. They are giving the experimenter attributes which are appropriate for most objects labeled by those words and these attributes are an essential component of the concept represented by the word. Not all of the appropriate attributes which can be cited are relevant every time the word is used, but they are potentially there, and will be evoked if the context warrants it. It is stated above that there are no basic *objects* in the real world, but there are certainly basic level *concepts* which correspond to our everyday vocabulary and Rosch has been studying these concepts through their linguistic labels.

Inter-item Associations

Psychologists working in the verbal learning paradigm have claimed that they were studying lexical meaning because words were often used as stimuli in their experiments. In verbal learning studies the techniques came to have more importance than discovering types of lexical meanings, and the goal of such studies came to be exploring how the learning task might be affected by changing the stimuli, not how subjects' judgements of the stimuli might be affected by changing the task, a basic objective of lexical semantic research. Although verbal learning methods are the dinosaurs of modern psycholinguistics and the experimental procedures have become fossilized, some verbal learning techniques have been adapted for lexical semantic studies. One such prominent method is the associative technique which has been applied by Deese (1965; Szalay & Deese, 1978) for investigating the meanings of words. This topic is addressed here.

James Deese began his research as a reaction against the classical associative laws of contiguity and frequency. These two laws state that two stimuli will only become associated if they occur together in the environment. In addition, the more often two items appear together the more likely they are to become associated. Deese (1965; 1968; 1969) assumed that there is an underlying structural organization for concepts and the pattern of associative responses to a set of stimuli could reveal aspects of this underlying structure. He was not only assuming that lexical meanings are static but also that the associations among them are.

According to Deese, two concepts are considered related in meaning when they have common associates or elicit each other as associates. The experimenter begins by selecting a lexical set of interest and then each subject is asked to list one associate for each stimulus. The stimuli are then arranged in a matrix where the cells indicate the frequency with which any pair of stimuli elicit common associates. The matrix is used to calculate an index of inter-item associative strength based on the conditional frequency of occurrence of a particular response in the distributions of both members of a pair of items. "The commonality in distribution, then is the sum of the conditional frequencies of occurrence divided by the geometric mean of the N's of the two distributions" (Deese, 1965, p. 51). The subsequent coefficients can then be factor analyzed in an attempt to determine the structural relationships among the common associates. Calculation of inter-item coefficients is only valid if associative responses are symmetric, but they rarely are. An erroneous assumption of symmetrical relations in responding is a fundamental flaw in using the associative method as a technique for studying lexical meaning.

The inter-item coefficient is based upon two assumptions. The first is that the initial response to any stimulus is the stimulus itself, even though subjects never overtly produce it. The second, and much more crucial assumption is that:

> ...there are no within individual constraints in the distribution of associates. Such an assumption can be interpreted to mean that each individual

> contributing an association to a sample is equally likely to give the association contributed by every other contributor. (Deese, 1965, p. 50)

There is no reason to believe that this premise indeed holds given the highly idiosyncratic nature of free associations. The only way this assumption is likely to be met is if the subjects in any particular experiment form a very homogeneous group, but this would restrict the researcher's ability to interpret his results as being applicable to any more general population in a linguistic community.

Perhaps because of these difficulties, Deese (Szalay & Deese, 1978) has turned his attention to using associative structures for the purpose of cross-cultural comparisons. This has required a slightly different method of analysis than that used for the inter-item associative experiments. The subjects no longer give one response for each stimulus; instead, they are instructed to provide continuous associations for one minute.

The responses are weighted for salience using the assumption that words listed first have a higher degree of salience than later responses. This assumption is supported by the finding that words in early positions are usually given by several subjects, while later responses tend to be idiosyncratic. Responses from all the subjects are grouped together into categories on the assumption that they share certain meaning components. The percent of responses in a certain category that occurs for a cultural group provides an index of the extent to which a meaning component is relevant to that group. In a study reported by Szalay and Deese (1978), 4% of the American students used as subjects produced associates in the Polite component for the stimulus *educated*, while 27% of the Colombian informants did, indicating that politeness is a more important part of the meaning of *educated* in Colombian culture than it is in the United States.

Szalay and Deese's use of percent responses for a particular semantic component is based on the assumption that the semantic components discovered through analysis are exactly the same across languages. The concept of *polite* is probably different for Colombians than for Americans. It is not, then, valid to make a direct comparison between the Colombian and American meanings of *educated* in relation to *politeness*.

Deese's experimental procedures do not present any contextual cues to constrain subject responses, so that subjects may produce a variety of different associates for a single stimulus. This creates a difficulty for the interpretation of inter-item associations since the matrix recording the frequency of shared associative responses will contain many empty cells. These empty cells provide no information about common attributes of meaning in a semantic set, the main purpose of most lexical semantic studies.

Deese has restricted the stimuli so that they come from a single lexical field, and there is no reason not to limit the responses also. Subjects could be instructed to "list the most prominent attributes of the following animals" or, for the study mentioned above, "list the attributes of an *educated* person." Rosch et al. (1976) have had success with the direct approach in attempting to discover the relevant attributes of particular categories. An attribute listing task might also prove useful for verifying or interpreting the structures arrived at through multidimensional scaling or hierarchical clustering of similarity of meaning judgements or semantic differential ratings.

Deese's approach to the study of lexical meaning illustrates several fallacies held by researchers in the area of lexical semantics. He assumed that associations are invariant links among words and that these links would be common across subjects. Meaning is not association, however; it is knowing that there is an association between two concepts. The subjects actively participate in the experimental task and contribute to the results. Meaning components can only be inferred from the ways that subjects respond to experimental tasks.

Similarity Judgements

Most of the data gathering techniques discussed in this chapter involve comparisons of the similarity of meaning of words. Thus, it is not surprising that one method for collecting data about lexical meaning requires subjects to make direct judgements about the similarity of meanings among a set of related words.

Subjects' judgements can be elicited through two types of tasks, classification and rating. Classification tasks ask subjects to sort the set of stimuli into subsets which share some meaning component. The usual procedure is to present subjects with a set of cards containing one word on each card (Anglin, 1970; Miller, 1967/1971) and ask them to sort the cards into piles. Another type of classification task requires subjects to link the set of words into trees, beginning with the "most similar" pair, in such a way that the entire set is connected (Fillenbaum & Rapoport, 1971).

The classification techniques only allow subjects to link one pair of words or subgroups at a time. If they should see that one item is semantically related to two different subgroups they cannot indicate this in their responses since each item can belong to only one subgroup. Analytic methods such as hierarchical clustering or multidimensional scaling require that all of the subgroups be linked into one structure, but this overall linkage may be carried out in an arbitrary fashion by the subjects (Fillenbaum & Rapoport, 1971).

Rating techniques avoid some of the difficulties of classification procedures. In a typical rating task the subjects are presented with all possible pairs of words in the set to be rated and are asked to assess the degree of semantic similarity (or dissimilarity) for each pair on a similarity scale, usually seven or nine points (Miller, 1967/1971; Magnera, 1977). The subjects can use different criteria for different pairs of words, although it is hoped that they only utilize a few basic dimensions or components for judging each set. The major drawback with rating methods is the enormous number of pairwise judgements subjects must make. Each set requires the consideration of n(n-1)/2 pairs, and this puts a practical limit on the number of words which can be studied in any single experiment.

When the judgement techniques were first employed, heterogeneous sets of concepts were used in an effort to discover semantic relations across the entire lexicon (Miller, 1967/1971; Anglin, 1970). It quickly became apparent however, that only gross semantic features such as concrete-abstract, or animate-inanimate were revealed by the data. These features are so obvious that it hardly requires an experiment to discover them. Ideally, data gathering methods should suggest more subtle and less obvious semantic components. Such components can only be discovered by studying homogeneous rather than heterogeneous sets of stimuli, that is to say, words from the same semantic domain.

Choosing words for a lexical semantic study presents a problem for the researcher since he must have some *a priori* conception of the lexical domain to be studied in order to select a set of stimuli that would be representative of that domain. The researcher does not want to select items in such a way that the results are almost predetermined, as in the early studies which had a concrete-abstract dimension built in (see in particular Anglin, 1970). Fillenbaum (1973) describes the item selection procedure followed by

Fillenbaum and Rapoport (1971):

> We looked at cases where we had some idea of what might be involved but where things were not so contrived that, at the very best, we might come out only with a demonstration that we had been clever in our initial item selection. (Fillenbaum, 1973, p. 4)

Curiously, for experimental psychology, no theory has been developed to explain semantic similarity judgements, and the technique has been mainly used for data gathering without any attempt to prove or disprove a particular hypothesis. Fillenbaum and Rapoport's (1971) study of several lexical fields was really an attempt to compare multidimensional scaling and hierarchical clustering methods of analysis rather than an investigation into lexical semantics. It is comforting to know that the methodology is sound, but it would have been of more value if Fillenbaum and Rapoport had attempted to relate their results to a theory of lexical meaning. They have little to say in this direction except to assume that the structural analyses of multidimensional scaling and hierarchical clustering somehow reflect psychological structures. In the conclusion to this chapter the relationship between multivariate analyses and psychological organization is discussed in greater detail so no more will be said about it here. Perhaps Fillenbaum and Rapoport's lack of theoretical speculations is the fault of linguistics, which has not offered a theory of lexical semantics to which the similarity studies could be related; but then, neither has cognitive psychology.

In the instructions for rating and classification tasks, "similarity of meaning" is not defined for the subjects even though they are required to make judgements using this criterion. It might be expected that such vagueness in the instructions would make the task difficult for subjects to perform, but the similarity judging methods have been used for some time and the requirements of the task have not created any apparent difficulty for subjects. As pointed out in the last chapter, flexibility of interpretation is a fundamental fact about lexical meaning, one which people are quite used to dealing with every day, so it is no surprise that they can put a reasonably consistent interpretation on a vague specification in an experimental setting.

Subjects have not been provided with a precise definition of similarity of meaning because they should be free to choose their own meaning components for making comparisons (Fillenbaum, 1973). However, this should also entail a logical requirement to analyze the data, subject by subject, to determine if common or different strategies are being employed before the data are pooled for grouped analyses. Further, if the lexical field of interest to the researcher is not clearly delimited for the subjects, they may be interpreting the stimuli in a way not intended by the experimenter. A single lexical item can belong to two or more lexical fields. For example, the prepositions *in* and *on* can be both locative (*in the house, on the table*), or temporal (*in six minutes, on Tuesday*).

In the course of several years of research, a similarity judging task has been developed which circumvents the difficulties mentioned above and which provides the best method for obtaining semantic similarity ratings (Magnera, 1977; Marckworth, 1978). This technique is described in detail in Chapter 5 but a few remarks are relevant here. The procedure devised by Baker (personal communication) is a rating task where each word is compared to every other word on a nine point "similarity of meaning" scale. The restriction of the stimuli to a particular field can be accomplished by presenting subjects with a sentence frame which provides a minimal context for constraining the interpretation of the stimuli.

Presenting words from a single lexical field should also provide a context for restricting the semantic interpretation to the intended one. This phenomenon has also been reported in recognition studies (Kintsch, 1977); when a word like *bark* is originally presented in the context of *tree*, it is not recognized as an old item in the context of *dog*.

Similarity judging tasks seem ideally suited for exploring particular semantic domains but it is important to note that similarity judgements can only reveal information about the differences in meaning between words in the actual stimulus set and not about what these lexical items have in common to make them a part of the same lexical domain. Similarity judgement experiments implicitly adopt some of the fundamental principles of structural field theory: 1) the meaning of lexical items can be described, in part, through their relationships to other lexical items, 2) there are semantic domains, 3) each domain has an internal structure, and 4) lexical meaning may be characterized by semantic components, features, or dimensions. Many of these themes are relevant to other studies discussed in this chapter, but similarity judging tasks seem to exploit the structural semantic principles to a greater degree than the other methods.

Conclusion

Psychologists have been somewhat successful in discovering potential psychological aspects of meaning. Like linguists, however, psychologists have proceeded under the assumption that language users have an invariant representation of a structured lexicon. The psychologists working with lexical semantics thought they could also characterize *the* structure of the mental lexicon (Fillenbaum & Rapoport, 1971) or semantic space (Osgood, Suci, & Tannenbaum, 1957). It was assumed that lexical semantic relationships formed a coherent structure (presumably in human minds, although it is often described as if it were floating somewhere in the universe) and experimental psychologists had only to find the proper methods for revealing the organization of the entire lexicon.

The assumption of a structured mental lexicon is in part a result of the powerful multivariate statistics used to analyze similarity data, in particular, factor analysis, multidimensional scaling, and hierarchical clustering. It must be emphasized that the "structures" revealed by these analytic techniques are a result of the numbers fed into them and that such structures may have no relationship whatsoever to psychological organizations except to the extent that the original numbers are the result of subject performance on some experimental task. If the stimulus set were altered by adding or subtracting an item, the results might indicate a quite different structure. It is therefore important to verify the results of any given analysis by using different techniques. The researchers who use multivariate statistics are no doubt aware of their theoretical limitations and yet, the analyses are often written up as if they represented the cognitive structure of a semantic domain. Fillenbaum and Rapoport, Deese, and Osgood, in particular, treat their analyses as if they were actual representations of psychological organization, but they do little to validate these claims.

Psychologists have not really been any more successful in describing the lexicon of a language than linguists. They have, however, discovered some organizing principles relevant to lexical meaning: 1) categorization based on perceived similarity of concepts (Rosch, 1978; Deese, 1965; 1976; Fillenbaum & Rapoport, 1971; Carroll & Wish, 1974), 2) the salience of some semantic components over others (Szalay & Deese, 1978; Rosch 1978) , and 3) affectivity of lexical meanings (Osgood, May, & Miron, 1975; Wundt, 1907; Zajonc, 1980).

People may perceive objects and events in similar environments and eventually form categories which group these items on some conceptual basis such as *fruit* or *furniture*. Observations of such categorizations are behind Rosch's notion of basic objects and Deese's (1976) concept of grouping. Developmental data from free association studies provide further evidence in favor of gradually emerging cognitive categories. When asked to give free associations to a list of words, young children usually give syntagmatic responses, probably as a consequence of the way they have observed objects in their limited experiences.[1] Children have not had enough contact with the world to use any other basis for classification than "these things occurred together." As they mature, the children learn to organize experiences using a similarity criterion different from experiential contiguity.

Cognitive categories are a major factor contributing to the salience of lexical fields in lexical semantic experiments. The most interesting and interpretable results are always obtained when semantically homogeneous rather than heterogeneous sets of words are used as stimuli, and it seems obvious that subjects in these experiments have some notion of semantic domains. This is one aspect of psychological studies which forms a direct link to linguistic theories of lexical fields, and the evidence suggests that something like semantic domains is a basic organizing principle for lexical meaning.

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[1] Anglin (1970) reports a particularly poignant example of syntagmatic responses from a clustering task; third and fourth graders sorted *needle*, *doctor*, *weep*, *sadly*, and *suffer* into one group while adults used more conventional distinctions such as animate-inanimate and concrete-abstract as the basis of their sorting.

A lexical set may restrict the interpretation of the component words. For example, in the instructions for the semantic similarity experiments presented in Appendix A1, subjects were given a sample set of temperature words: *frigid, cold, cool, tepid, warm, hot, boiling*. The interpretation of these words must be restricted to the domain of liquids because of the presence of *tepid* and *boiling*. This affects the interpretation of the other terms which could have a different relationship to each other if the domain of interpretation were non-liquids.

Most of the data gathering methods reviewed in this chapter have involved some attempt to assess the similarity of meaning of words. The semantic differential looks for similar rating profiles; Rosch's studies are attempts to discover the degree to which two concepts share the same meaning features; Deese attempts to quantify similarity of meaning through shared associations and, of course, semantic simliarity ratings directly tap subjects' judgements about this measure. Estimates of the similarity of two concepts can be easily converted into proximity data for entry into multidimensional scaling and hierarchical clustering programs. These techniques analyze judgements based on the human ability to categorize stimuli which have a shared similarity of some semantic components. Finding similarities between pairs of items may be a basic human cognitive propensity (Carroll & Wish, 1974), and it is quite possible that people organize their perceptions of the world in such a way that similar items are categorized together.

It was suggested in Chapter 1 that lexical meanings encode various aspects of concepts. Those entities which are important to a culture are most likely to be denoted by lexical items. The meanings of lexical items can also be thought of as consisting of semantic components. For a particular lexeme some of its semantic components will be more readily apprehended than others, for example the POSITIVE aspect of *praise*. Those semantic components which are reinforced by cultural convention will be the most salient for the meaning of a lexical item.

Individual lexical items may also have a high degree of salience when represented as part of a lexical set. Rosch's category prototypes and basic objects levels represent the most salient members of particular categories. Deese's (Szalay & Deese, 1978) use of continuous associations is also based on the notion that the more salient associates will be listed earlier than less salient associates. Almost all experimental research is based on the assumption that subjects will respond to the most salient aspects of the stimuli.

Salience is probably also an important factor in children's acquistion of lexical meaning. Children learn categories more quickly when they are presented with good examples than when they are presented with poor category members (Mervis & Pani, 1980). This suggests that the most salient members of a category are the best representatives for aiding children in discovering the attributes of categories. It is unlikely that children learn the meanings of words or categories as complete wholes. First, they learn the most salient features of the referents of words and later learn additional components. Which particular components are salient may vary from speaker to speaker depending on their life experiences. Some components, however, will be salient across individuals, at least to the extent that they have had similar experiences. Salience mainly covers those aspects of lexical meaning which are conventionally reinforced in a linguistic community. Those aspects of a concept which are most salient are most likely to be represented in the core meaning of a lexical item.

In addition to being able to perceive similarity of meaning and the salience of semantic components, people have the ability to make positive and negative judgements about concepts. This aspect of subjective meaning is usually considered to be the most critical for psychological meaning and is also the most idiosyncratic. Osgood's work with the semantic differential seems to indicate that subjects will produce positive or negative evaluations for just about any concept and the Evaluative dimension is usually the most salient in an analysis of semantic differential ratings. The positive/negative assessment of events and objects is an important aspect of human cognition. Certain concepts may have conventionally determined evaluations in a particular culture. The researcher into lexical semantics is generally interested only in the evaluations shared by a linguistic community but not in idiosyncratic judgements based on an individual's past experiences.

Osgood (Osgood, May, & Miron, 1975) has found that the Evaluative dimension occurs over and over in cross-cultural research. One reason for this is that humans universally make positive and negative judgements about objects, events, and social practices. The evaluation assigned to particular objects and events may differ from culture to culture (the value of a war by winners and losers, for example) but the basic process of judging is probably the same for everyone.

The previous chapter suggested that one of the difficulties with linguistic approaches to lexical meaning was the failure to view it as an integral part of human cognition. To some extent, the psychologists discussed in this chapter have also failed to keep the language user in mind in their attempts to analyze lexical meaning. They have acknowledged that psychological meaning can be subjective; in particular, salience and affectivity are based on the idiosyncratic experiences of language users. In spite of this, psychologists have proceeded to analyze the experimental results as if every subject had responded in the same way.

Subjects often do respond alike because within the context of an experiment subjects may refer to conventional rather than idiosyncratic knowledge of word meaning. It is still possible, however, to have intersubjective variation within a lexical semantic experiment. Conventional meaning about the words in a lexical field may evoke many different meaning components, and some of these meaning components may be more salient for some subjects than others. In the kinship terms study reported in Chapter 6, all subjects perceived the four meaning dimensions found, but three different subject strategies were imposed on these dimensions.

In the kinship study each of the three subject groups found one particular dimension more salient than the others. Subject groups such as those reported in the results chapter must occur because different subjects have had different past experiences. Unfortunately, it is almost impossible to determine beforehand which experiences will be relevant in a particular experiment so that appropriate information for determining subject groups could be elicited. It is important to approach the analysis of data from semantic experiments as if the subjects had responded differently, and subject groups should be looked for using the proper analytic methods. Such a procedure is adopted and described in Chapter 5.

Chapters 2 and 3 have indicated that research into lexical meaning has been somewhat inadequate because researchers have not considered meaning to be an integral function of a language user's cognition. Many attempts at analyzing lexical items have been directed toward finding fixed meaning structures rather than looking for possible variation in the interpretation of meaning based on contextual information. The next chapter discusses the relationship between lexical meaning and cognition in an attempt to suggest how language users convey and interpret meaning.

CHAPTER 4

TOWARD A THEORY OF LEXICAL SEMANTICS

Introduction

The previous two chapters have discussed the efforts of linguists and psychologists to understand the meanings of words. It was seen that researchers in both disciplines have tried to separate a purely linguistic meaning from a more general psychological type. It is somehow forgotten that thinking, speaking, and feeling all take place within the same individual, who often tries to communicate about his internal and external experiences. Meaning cannot be separated from the experiences an individual has since our environment and our actions are meaningful for us. Given that meaning is embedded in cognition, it follows that an adequate theory of meaning cannot be formulated until human cognition is better understood, and we are still a long way from that goal!

As many authors have noted, there is a lamentable lack of a theory about lexical meaning (Munro, 1978; Rice, 1980;

Smith, 1978; Szalay & Deese, 1978). Such a theory should account for all of the following: 1) the psychological representations of word meanings, 2) the productive rules for combining word meanings into meaningful utterances, 3) the manner in which words help language users label and organize the world, and 4) the shared versus idiosyncratic aspects of lexical meaning. No theory has been formulated which covers all of these facets of lexical meaning, probably for the reason given earlier that there is no comprehensive theory of human cognition. This chapter discusses some attempts at explaining lexical meaning which have been made in each of these areas. It will be seen that, in many cases, psychological theories of word meaning are really very similar to some of the linguistic theories discussed in Chapter 2. Although linguists and psychologists would claim to have little in common, the approaches to lexical meaning taken by each group are surprisingly similar. In particular, both disciplines have relied on semantic decomposition for representing lexical meaning.

Psychological Theories of Lexical Representations

In Chapter 2 it was seen that linguists formulated lexical representations which were designed to play a role in the interpretation of sentences. The meanings of sentences were thought to be a function of the meanings of the words which made up those sentences. Psychologists have been more interested in what they call "semantic memory", which shows how the meanings of words are interrelated in paradigmatic types of stuctures. Even though linguists and psychologists focus on different aspects of lexical meaning, and use different terminology, their theoretical constructs are not all that different. Researchers in both disciplines usually assume that the meanings of words can be represented by sets of defining features. Psychologists have employed a type of componential analysis in constructing their models, even though they do not accept all the linguistic assumptions associated with componential analysis. The two most well known models of semantic memory are the set-theoretic (Rips, Shoben, & Smith, 1973; Smith et al., 1974) and network models (Collins & Quillian, 1972; Collins & Loftus, 1975; Loftus, 1975). These models are presented as opposing and mutually exclusive views by their respective proponents.

The network model assumes that the semantic representations of words are nodes linked to other nodes in a hierarchic complex. When a particular node is activated, the attribute nodes attached to it are also activated. Different weights are assigned to the various paths linking concepts and their attributes so that essential attributes will have more salience than non-essential attributes.

The set-theoretic model represents word meanings as sets of features. The more features two concepts have in common, the more similar in meaning they will be. Features may be either defining or characteristic (Smith et al., 1974). Defining features are those which could apply to the prototypical members of a class or category, for example, all birds are ANIMATE and FEATHERED. The specific attributes of particular members of a category are represented by characteristic features such as size or color. In the comparison of any two word meanings, characteristic features are considered first and then the more specific defining features are processed. Typical members of a category will share more characteristic features with their superordinates than less typical members. The set-theoretic model is based on lexical decomposition and shares many of the problems which linguistic theories encountered. Chapter 2 has already discussed many of the difficulties which arise when lexical meanings are represented by an invariant set of features.

The set-theoretic and network models claim to be alternative representations of semantic processing. Hollan

(1975) has argued that they are essentially the same kind of representation and that one can be translated into the other. Rips, Smith, and Shoben (1975) object to this view on the grounds that their model makes different statements about semantic processing than the network model, and that the differences between the models are not just a matter of the form of semantic representations. There is strong evidence (Broadbent & Broadbent, 1978; Broadbent, Cooper, & Broadbent, 1978) that people do not use exclusively a network or a set system in recall, but that both systems are used, although some subjects showed a preference for one type over the other. Broadbent, Cooper, and Broadbent (1978) found that recall of a list of words is essentially the same whether subjects receive the data organized in a fashion consistent with the network or set models. Recall should have been better for one presentation over the other if one of the two models corresponded with the psychological organization of lexical items.

Another theory of lexical meaning which relies heavily on lexical decomposition is the procedural semantics of Miller and Johnson-Laird (Miller & Johnson-Laird, 1976; Miller, 1978a;b). Procedural semantics has been influenced by the goals and theoretical constructs of generative grammar. Miller and Johnson-Laird have attempted to develop a theory of lexical meaning which is based on a propositional analysis of word meanings, since the semantic representations of generative grammar are supposed to represent the logical form of a sentence. Procedural semantics analyzes meaning into the perceptual and functional predicates appropriate for identifying a referent. The concept *table* might be represented by the propositional analysis presented below. This propositional notation is interpreted in the following way: a table(x) is a solid (RIGID), movable (MOVABLE) object (THING) with connected parts (CONN), the principal part (PPRT), the worktop (WORKTOP(y)), has the function of supporting (SUPPORT(z)) other objects (SUPPORT(z,y)). Miller and Johnson-Laird's propositional notation of this definition is as follows:

> TABLE (x)
> THING (x)
> MOVABLE (x) + CONN (x) + RIGID (x)
> PPRT (x, WORKTOP (y))
> PPRT (x, SUPPORT (z)) + SUPPORT (z,y)
> (Miller & Johnson-Laird, 1976, p. 233)

The propositional notation is considered to be crucial because the meanings of words can be represented by sentence-like definitions, and "in the absence of any other approach, lexical concepts must be defined in terms of sentential concepts" (Miller, 1978a, p. 71). Procedural semantics is the psychologists' version of generative semantics, and shares all of the linguistic theory's difficulties. A propositional theory is only componential analysis in fancy dress, and it has already been mentioned that the major difficulty with componential theories is the impossibility of determining which features are crucial for the identification of an entity and which are superfluous.

Images are one way to avoid the use of features in the representation of meaning. Paivio's dual coding hypothesis (Paivio 1971; 1974; 1975; 1978) states that verbal and nonverbal information are represented and processed by two different psychological systems; an imagery system which represents perceptual knowledge, and a verbal system which operates specifically on linguistic material. The two systems function independently, but a representation in one can be converted to a type appropriate for processing by the other system if circumstances require it.

Paivio's definition of a mental image has not been clearly stated and it is difficult to determine exactly what he means by the term since he states that the image does not always have to be a conscious experience (Paivio, 1971). A mental image appears to be some kind of symbolic representation for concrete objects and motor movements which is different from that for the concepts represented by abstract nouns and attributes.

The dual coding theory is an attempt to characterize a number of different distinctions such as reference versus meaning, concrete versus abstract attributes, analog versus discrete representations, and psychological versus linguistic meaning. Many of these distinctions are discussed elsewhere and it seems an over-simplification of the complex issues involved to attempt to characterize them by two different representational systems. Imagery is no doubt an important psychological variable for some subjects in performing some experimental tasks but it cannot be the sole basis for a theory of lexical meaning. In particular, dual coding theory does not account for the connotative aspects of lexical meaning which cannot be acquired either from the perceptual image of an object or the form of a word.

While dual coding theory appears weak on theoretical grounds, it is not supported by experimental evidence either. Experimental evidence for the two coding systems is based on reaction time to judge which of two objects has a greater degree of some attribute. Pavio's theory predicts that it should always take longer to judge abstract than concrete attributes, but this has not always been the case

(Paivio & Marschark, 1980, Paivio & te Linde, 1980). The results of semantic comparison studies have forced Paivio to admit that information from the verbal and imagery systems must interact (Paivio & Marschark, 1980). Since Paivio has had to hypothesize that imagery and verbal information may converge in certain tasks, his claim for two independent but interrelated systems of representation is considerably weakened. Paivio and his co-workers have yet to convincingly demonstrate that people have two independent kinds of information stores available to them.

Many authors think that the type of lexical representation formulated is crucial to their theory of semantic memory, an example being the controversy over set-theoretic versus network models of semantic memory, but a representation is not the actual thing represented; it is merely an attempt to convey information about some indirectly observed phenomenon. Palmer (1978) discusses the various ways representations may interface with the things represented and he concludes:

> In order for a "thing" to be a representation of any sort, it must preserve at least some information about its referent world. There is an important sense in which the nature of a representation is simply the view it presents of the represented world. (Palmer, 1978, p. 300)

In the following chapters it will be assumed that a particular representation is simply a convenient way to depict information about lexical meaning but the notation chosen is in no way intended as a picture of the actual organization of lexical meaning within human cognition. That is a matter which can only be studied indirectly through subject performance on experimental tasks, and the representations reflect lexical structures which result from subjects' responses. The manner in which word meanings are stored is not as important as the way such information is accessed and used at any given time.

Idiosyncratic vs. Conventional Meaning

The theories of lexical representation discussed in the previous section have much in common with linguistic descriptions of the lexicon. Both linguists and psychologists have attempted to separate conceptual meaning from linguistically encodable meaning. The idea persists in both disciplines that there can be an autonomous linguistic semantics. I wish to claim that all meaning is in some sense psychological and cannot be separated from the other aspects of an individual's cognition. The usual objection to this view is that it should be impossible to communicate if meaning is solely part of cognition because each person has a different world view, and would therefore assign different meanings to words (Clark & Clark, 1977). This objection can be overcome if language users are given some credit for being aware of how language is employed for the purposes of communication.

I believe that there are two categories of meaning, but they do not correspond to linguistic versus psychological meaning. The distinction which exists is between conventional (shared) knowledge about a word's meaning and conceptions derived from unique personal experiences which can also be encoded into utterances. What has previously been called linguistic meaning is, for the most part, the conventional knowledge shared by speakers in a linguistic community. Learning the conventional meanings of words is an important part of the language acquistion process. Children learn that certain words are used in certain situations or when particular objects are present. In the previous chapter it was noted that the salience of some aspects of an object or situation contribute to the development of conventional meaning. The most salient aspects are those most often noted and commented on within a community.

Idiosyncratic conceptions develop from experiences which are not generally common within a society. The idiosyncratic component of a word's meaning is likely to have an affective character, although as noted previously, affective components can also be conventional for certain types of words. It may seem odd to discuss the idiosyncratic meanings of words since word meanings by definition ought to be conventional. A word is after all a form which is supposed to represent a unified concept available as a topic of discourse. However, it is possible that a particular individual's past experiences can influence how he perceives the concept associated with a word. For example, English speakers can generally agree what a chiropractor does, how he obtains his training, and even, to some extent, what his office might look like. This would constitute at least part of the conventional meaning of *chiropractor*. Based on past experiences, however, people may differ widely in how they regard chiropractors. For some people they are quacks, while for others they are professionals who helped a loved one when all else failed. When either group uses the word *chiropractor* they will not be able to divorce their idiosyncratic opinions from the more conventional components that are part of knowing what a chiropractor does. Furthermore, when people holding differing opinions about chiropractors talk to one another they may not really be communicating, especially if they do not realize that each has a different view about the value of chiropractors. It is in this sense that I wish to claim that there can be idiosyncratic as well as conventional meaning components.

In most cases conventional meaning will predominate since it is usually difficult to know the idiosyncratic interpretations someone may place on a situation. The less familiar someone is with his audience, the more he will rely on conventional knowledge. This situation usually holds in an experimental setting. The subject is in a relatively novel situation and is presented with words delimited by minimal contextual information. In spite of any instructions to dispel anxieties about performance, the subject wants to produce the "correct" answer, namely, the response given by everyone else. Subjects are likely to have an idea of what the conventional responses are going to be, and they behave accordingly. In Rosch's categorization studies, for example, subjects used the basic level words because these were the most conventional responses under the conditions of that experiment.

In other situations, with people familiar to him, the speaker can utilize his knowledge about the personalities involved to help him interpret utterances. This is where the variability of word meanings becomes important. The speaker and hearer can use words in unconventional ways which would not ordinarily be comprehended by an outsider because they understand the situation and each other. Language users expect utterances to be meaningful and to make sense. If, at first, things are unclear, they will search their memories or ask questions until they feel they can correctly interpret the intended message.

Rommetveit (1974) gives the example of two friends at a football game. In the context of the game being played the utterance "magnificent" is sufficient to convey a message about a particular play. After the game, however, the single word utterance is uninterpretable and the speaker must describe the play in detail in order to convey the same message. The amount of detail necessary to identify the play depends on whether or not the hearer was present at the game. The speaker and hearer must take into consideration what they know about one another's experiences. This is what Rommetveit calls "mutually shared intersubjectivity."

Experimental evidence supports the notion of mutually shared intersubjectivity (Zajonc, 1960). Subjects who were told they would have to describe someone to others on the basis of a letter he had written, encoded very specific information about this person, e.g., "didn't finish college because of financial problems." Subjects who thought they would receive a description of the fictitious person only encoded general information about him such as "intelligent", or "immature."

When speaker and hearer know each other well, their utterances can take on a less conventional form; often one word will suffice to convey a complicated message. Speakers and hearers who are well-known to one another will probably be aware of the other's idiosyncratic uses of certain words and can correctly interpret each other's utterances. Inappropriate reliance on idiosyncratic usage can, of course, interfere with communication. A schizophrenic carries this to extreme and can no longer be considered a useful member of society. An effective communicator knows how to balance idiosyncratic and conventional meaning, and most normal language users are cognizant of what is appropriate in a given situation.

Lexical Items in Utterances

A language user must know how to combine words into utterances in order to convey effective messages. In a particular utterance, words are the linguistic devices used to designate the things being talked about, and are therefore, one of the more crucial information conveying components of an utterance. It is possible that primitive conceptual information could be conveyed by strings of isolated words (Moulton & Robinson, 1981). Such an exchange of information would be strongly context dependent and it would be difficult to indicate relationships between the entities designated by the words. It is therefore necessary to have some mechanism for relating concepts in order to talk about events and experiences which are displaced from the context of speaker and hearer. Syntax is the component of language which allows language users to indicate relational information. The syntactic devices enable a hearer to combine the meanings of the component words into a unified whole because they indicate how the elements of a sentence are related to one another. The hearer considers the meanings of the lexical items and the relationships suggested by the syntax and from these two kinds of information he begins to determine what message was intended. The hearer may also use information about the situational context to help him decode the utterance.

A distinction should be made between the information content of a message and the linguistic devices used to convey this information. Most of the linguistic theories discussed in Chapter 2 have been concerned with the forms of linguistic devices rather than the information conveyed by those devices. The Information Structure[1] view of language is a psycholinguistic framework which relates to the information conveying capacity for communication of particular linguistic devices (Baker, 1976; 1979; Derwing & Baker, 1978; Prideaux, 1979). A basic premise of this theory is that during the encoding or decoding of an utterance an individual may draw on knowledge from any part of his cognition and is not restricted solely to the language system. Humans will employ any devices available for communication; the most useful devices for this purpose happen to be linguistic.

A particular message may be described in terms of three information types: sentential (Is), relational (Ir), and denotational (Id). These devices are used to describe the Information Structure of a particular utterance, they do not represent an abstract system of rules for producing or comprehending utterances.

Sentential information is manifested by what has traditionally been called sentence mood, such as, declarative, interrogative, or imperative. Relational information corresponds to the grammatical roles played by the syntactic constituents. In English relational information is indicated by position in utterances; other languages use case endings as relational devices. Denotational information designates the entities that a particular speaker is talking about. Lexical items are the most common linguistic devices used to convey denotational information.

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[1] The terms information and communication as they are used here are not to be confused with the way they are defined in the Information Theory of Shannon and Weaver (1949) which has primarily a mathematical rather than a linguistic orientation.

Denotational information is not to be confused with traditional notions of denotation corresponding to one of the interpretations of reference given in Chapter 1. Part of denotational information is all of the objects to which a word can apply but it also includes all of the other things a person knows about an entity, such as relevant attributes, emotional reactions, motor protocols, etc. The previous two chapters have shown that both linguists and psychologists unsuccessfully attempted to exclude some of these information types from their theories of lexical semantics.

Exactly how much information must be encoded about a particular unit of denotational information depends on what the speaker thinks the hearer knows. The speaker can miscalculate and encode more than necessary, in which case the hearer becomes impatient and feels condescended to, or the speaker can provide too little information for identifying the appropriate denotational unit and the hearer must ask questions until he thinks he understands.

Lexical meaning is not precisely the same as denotational information although the two are closely related when single words are sufficient for the speaker's intended message. Denotational information specifies those entities referred to in a particular utterance and, as shown above, only those aspects of an entity necessary for appropriate identification by the hearer are provided. Lexical meaning represents the potential information units which could be explicitly stated but may not be. In any given utterance the words, phrases or clauses that may be required to properly direct the hearer's attention to the entities and acts involved in an utterance are the linguistic devices used to express denotational information, and their meanings are interpretations placed on them by both speaker and hearer. A particular Information Structure only describes what is found in a particular utterance, and not the potential meanings which are not manifested on that occasion. A theory of lexical semantics should be compatible with the ways words are used for conveying denotational information.

Lexical Items and the Real World

Information Structure is predicated on the assumption that utterances can only be interpreted in context. In order to communicate, each speaker and hearer must have a store of units for designating denotational information. This is usually the language user's lexicon. Lexical items forge a link between entities in the real world and people's conceptions of those entities. Usually people perceive the world as having some kind of organization and if this is not readily apparent they will impose an organization which seems approriate. The principles for organization are probably quite simple although the resulting structures may be complex. Lexemes play a role in forming and maintaining organizational complexes. Words label the individual entities available for categorization; words can also label general categories. Once certain categories are established, new ojects can be interpreted as belonging to one of the preexisting categorical concepts.

The real world is not an unstructured confusion of stimuli; the knower interacts with the world and perceives structure. Wundt (1907) has pointed out that the perceived world cannot exist without an active knower, and the knower is part of all his perceptions. Interpreting Wundt's notion within the present framework one could say that the knower's perceptions are influenced by idiosyncratic experiences as well as the conventional interpretation of the world suggested by his culture. Lexical labels play an important role in the interaction between the knower and the perceived world. The existence of a word can imply to the hearer a corresponding entity. Labels can draw our attention to something we might not otherwise have noticed. For example, if someone is told that there is such an animal as a wombat, he may believe in its existence even if he has never seen one.

Contextual cues can help in the categorization of new stimuli. If one encounters some strange looking object in a friend's living room, the likely conclusion is that the item is an odd piece of furniture or an art object (or both combined). It would be extremely unlikely for the object to be some kind of industrial machinery. However, on encountering the same object at a factory, the conclusion would be that it was some kind of tool and not an artistic creation.

Lexical fields reflect conceptual organization of the world. Some fields appear to be natural because the same types of objects are often encountered in similar circumstances. Furniture terms, for example, are considered to belong to a single lexical field because various items of furniture are encountered in the same room or building. One strategy used by subjects in rating concrete lexical sets is to group objects by the place in which they occur, e.g., bedroom versus living room furniture, quite independent of the appearance of the objects in terms of size or shape.

Rosch's "basic objects" level of categorization was formed on the assumption that the real world is structured in such a way that certain bundles of attributes always occur together. Her example is that creatures with feathers are also likely to have wings (Rosch et al., 1976). It was thought that these co-occurring attributes were simply present waiting for an observer to notice and label them. The experimental evidence showed that there was a complex interaction between linguistic labels and real world attributes (Rosch, 1978). Rosch (1978) lists three kinds of responses which indicated that subjects made use of cultural and linguistic, as well as perceptual knowledge in providing attributes for objects: 1) some attributes require previous knowledge of the functions of an object before they can be labeled, e.g., *seat* of a *chair*; 2) attributes such as *large* are relative to the other objects in the lexical field, e.g., *piano* is large for furniture but not for mountains or buildings; 3) some functional attributes require knowledge of human activities, e.g., "you eat on it" for *table*.

Rosch has shown that the process of labeling concrete objects is far from simple. Labeling abstract entities may be even more closely tied to our knowledge of the lexicon than is labeling of concrete objects. An abstract entity such as an emotion is not directly perceivable distinct from ourselves. Outward symptoms of emotions are, of course, observable in others, but the actual "feeling" must, by its very nature, be an internalized experience. How could children learn to label such personal experiences? Probably, they are told by adults that they are happy or sad in the appropriate circumstances. The child learns the emotion word from his involvement in the emotion before he learns to perceive it in others. Having labels available facilitates the child's ability to discover the emotion in someone else. Language is an important aid in the process of decentration whereby the child learns to distinguish others from himself, and to begin to perceive the world from another's point of view (Brown, 1958b; Rommetveit, 1974; Bolinger, 1975).

Frames of Reference

It has been mentioned several times that meanings may be variable in that they can receive particular interpretations in specific contexts. The manner in which concepts are represented through language can also vary greatly. The same concept may be evoked by different words at different times, or by several words in syntagmatic combination, depending on how much information the speaker feels it necessary to encode. Sometimes the sound-meaning link may activate a connotative reaction, and at other times form or functional properties may be evoked.

It is obvious that language users must have some store for the word forms which are part of their language. A language user's lexicon should also have some productive rules for word formation. It is not clear, however, whether people derive words formed from productive morphemes as they speak, as Chomsky (1972) claims, or if they have a list for every form available in their language as Jackendoff (1975) suggested. Probably, speakers have both options available to them, but more experimental evidence would be necessary to determine how word forms are chosen for particular utterances.

The language user's lexicon must also represent some core meaning for the words which will be referred to when there is a minimum of contextual cues available to aid in the interpretation of meaning. The core meaning is the most conventional and most readily available meaning, but it is by no means the only interpretation which can be assigned to a lexical item. The core meaning also does not necessarily have to be evoked everytime a word is used. Idioms and metaphors are uninterpretable if one attempts to assign a conventional interpretation to their component words. And it either must be conceded that some words have more than one core meaning (e.g., existential versus locative *there*), or that we have different words which are indistinguishable in terms of their forms. How many different core meanings are there for the word *have*?

I think that language users have certain principles or strategies for organizing contextual information in such a way that they can interpret word meanings. I call these organizing principles, *frames of reference*. Frames of reference can be conventional or idiosyncratic. Conventional frames of reference are used to organize lexical items with some shared component of meaning. I use this term in preference to the more traditional *lexical field*, to indicate that this organizational process is dynamic and is used by an individual when he encounters a word or set of words in a particular context.

Conventional frames of reference are most likely to be used by subjects when they are asked to perform experimental tasks, because they are asked to consider lexical items in a minimal linguistic and situational context. In an experimental setting, normal conversational strategies of interpretation usually cannot apply. The subjects must construct some frame of reference in order to make the judgements required of them. The fact that most subjects in an experiment respond in the same way indicates that the frame of reference applied to a particular task is similar for everyone. This would be expected if subjects were using a conventional rather than an idiosyncratic interpretation for word meanings.

There are probably at least three different kinds of organizational frames which subjects can impose on a given semantic domain: 1) concrete, a kind of feature analysis for events and objects with underlying discrete components; 2) social frame of reference, where ego is related to other individuals and objects in his environment in a spatio-temporal manner; and 3) evaluative frame of reference, where a subject uses an internal perspective as to how he would judge certain word meanings.

Concrete frames of reference are applied to words which refer to stimuli with physical attributes. This can include objects as well as color terms and characteristics such as temperature, height, and weight. The organizational attributes used for concrete fields are size, shape, function, and place where objects can be used. Rosch's work, discussed in Chapter 3, has been exclusively within the concrete frame of reference. Results from experiments with tools and furniture words, as described in Chapter 6 of this dissertation, illustrate use of this frame.

The social frame of reference is used for relating the individual to society. Lexical fields which take a social intepretation are kinship terms and pronouns. Deictic categories such as locative prepositions and adverbs may also take this frame of reference. When using the social frame of reference the subject identifies himself as ego and all terms in the set are organized with respect to ego. For example, one result from the pronouns study reported in Chapter 6, is that first person pronouns are the most salient pronouns.

The evaluative frame of reference taps subjects' affective judgements about certain events. The types of lexical fields appropriate for this frame of reference are things such as the emotion terms and interpersonal verbs, again discussed in Chapter 6. The events referred to by these verbs are experienced in social contexts but they affect an individual in such a way that he perceives them in terms of "good or bad for me." Events which are of personal benefit are viewed favorably and harmful events are viewed unfavorably.

When no external frame of reference is possible, either social or concrete, subjects must use their personal evaluations as the basis for making judgements. This may be the reason that Osgood consistently found the Evaluative, Potency, and Activity dimensions from the semantic differential ratings of heterogeneous sets of words. If a particular scale could be interpreted referentially for a particular word, a subject would naturally do so. In most cases, however, ratings could only be made if the scales were interpreted metaphorically. Subjects had to perform the semantic differential ratings with reference to how they felt about the referents of Osgood's stimuli. The resulting variation of responses forced the factor analysis toward the

Evaluative, Potency, and Activity dimensions as has been discussed in Chapter 3. Self reference should also have been operative in the associative methods used by Deese.

Studies which present words in a lexical field such as similarity rating studies, provide enough context for the subjects to construct the frame of reference appropriate for a particular field. This is a further argument for using stimuli from the same domain rather than a heterogeneous set.

Subjects will use whichever frame of reference they can to complete the experimental task. The more contextual information they have available, the more explicit the frame of reference can be. Certain kinds of lexical items may also include a frame of reference as part of their meaning. These lexemes represent conventionally recognized situations, for example, many verbs of judging (Fillmore, 1969; Marckworth, 1978) or interpersonal verbs (Osgood, 1970) encode much information about the types of participants involved and their relationships to each other. It is not difficult to imagine the appropriate frames of reference for *seduce* or *betray*. Frames of reference, then, can apply to general categorization of a class of entities, or to the specific information encoded by individual lexical items.

Conclusion

This chapter does not present a comprehensive model of lexical meaning, but it does review some of the important issues which must be considered. The point of view proposed is that speakers and hearers are active participants in determining what meaning a word will have in any given utterance; they are also aware of certain aspects of lexical meaning such as what is conventionally accepted and what may be appropriate in intimate interactions. Words have potential meaning, and to choose a word is to decide to encode some aspect of denotational information. It is not desirable to eliminate personal knowledge from investigations of word meaning, but it is not always practical to study individuals rather than groups. The experiments which comprise the remainder of this dissertation are designed to focus on the conventional, shared facets of lexical meaning, those available in the most general circumstances. In particular, the data reported in Chapter 6 support the three frames of reference discussed in the previous section. Personal, idiosyncratic responses also affect experimental results. They can never be entirely eliminated from studies of human cognition. One experiment, reported in Chapter 7, shows that subjects will resort to idiosyncratic responses when the experimental setting is not constrained enough to provide a clue as to the appropriate conventional response.

CHAPTER 5

METHODOLOGY

The first half of this work was concerned with a theoretical framework for understanding lexical meaning. The second half presents some empirical evidence for the hypotheses proposed. This chapter describes the technical details of the data gathering and analytic techniques used for the studies reported in the next chapter which presents evidence in support of the three frames of reference discussed in the previous chapter. Chapter 7 reports two studies which contrast conventional and idiosyncratic interpretations of meaning. The technical details for those studies are reported in Chapter 7 since they differ from the methods used for the frame of reference studies.

Data for the frame of reference studies were obtained by two data gathering methods, semantic similarity ratings and card sorting. These data were then analyzed using two different analytic techniques, multidimensional scaling and hierarchical clustering. These data gathering and analytic methods are described in this chapter. In addition, some important issues in methodological approaches to semantic studies are also addressed.

Similarity Rating Studies

For the semantic similarity rating task the stimuli are presented in an upper-triangular matrix like the one in Figure 5.1. Subjects are instructed to rate each pair of words on a nine point "similarity of meaning" scale. A rating of 1 is given to word pairs which are "most similar in meaning" (i.e., closest in meaning), while a 9 is assigned to "least similar" (i.e., most distant), word pairs. Intermediate scale values represent various degrees of closeness in meaning.

Subjects were instructed to anchor their scales by first scanning the entire set of terms to find that pair which was most similar in meaning, and to assign "1" to that pair. Next, they were asked to find that pair in the set which was least similar in meaning, and to assign a "9" to that pair. Following this anchoring, they were then free to use the values from 1 to 9 inclusive to express their estimates of the closeness of meaning for all other pairs of terms. Subjects were also told to restrict their range of responses to the actual words presented and that they were not to consider words related to the stimuli but not actually presented. Sample instructions to the subjects are in Appendix A1.

Presenting stimuli from a related lexical set provides the contextual constraints necessary for directing subjects toward an appropriate frame of reference. A sentence frame was used to provide further information about the lexical items to be rated. The frame helps to restrict the domain of interpretation for the words. For example, the tools set listed in the next chapter could be interpreted as nouns or verbs in one or the other of the following sentential contexts. The frame *"They used the ___"* would insure a nominal interpretation for the tool words while *"They ___it"* would make the stimuli appear to be verbs.

The similarity rating task has the major advantage that it requires subjects to contrast the meaning of each pair of words in the data set. Subjects may use one meaning component for the pair A-B, and an entirely different component for judging the pair A-C. An analysis of their ratings might reveal subtle dimensions of comparison within the entire set of words. The similarity ratings method also allows subjects to indicate the degree to which they feel

	COLD	WARM	COOL	HOT	FRIGID	TEPID
BOILING	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
COLD		[ ]	[ ]	[ ]	[ ]	[ ]
WARM			[ ]	[ ]	[ ]	[ ]
COOL				[ ]	[ ]	[ ]
HOT					[ ]	[ ]
FRIGID						[ ]
TEPID						

Figure 5.1: Sample matrix for similarity ratings tasks.

two words are semantically related, so that with similarity ratings it is possible to discover differential salience of the underlying meaning components for each of the subjects. In other words, the semantic similarity ratings method can reveal two types of between subject variation; different relationships among terms where different semantic components are perceived, and differential salience for the same semantic components.

The major disadvantage of the semantic similarity ratings method is the large number of comparisons required, n(n-1)/2. This imposes a practical limit on the number of words which can be tested in any given experiment. About 21 terms seem to be the maximum which can be rated by subjects in a reasonable amount of time, without making them feel overburdened by the task demands.

Not all subjects were able to perform the task easily. Some subjects apparently saw little or no relationship among the words presented as stimuli, and rated a majority of pairs as having a similarity value of 8 or 9. If a particular individual used the same scale value for more than 50% of the word pairs he was dropped from the analysis of results. It was assumed that any subject who responded with such a large number of the same ratings would not provide sufficient differential information about the lexical set. In most cases there were not many subjects who had to be left out of the data analysis according to this criterion. The actual number of subjects dropped for each data set is reported in the next chapter.

If the subjects used the full range of the rating scale it was assumed that they were rating on similarity of meaning although the possibility exists that they had not understood what was expected of them. The only time it was not assumed that a subject was responding appropriately was when the rating scale was obviously reversed. Subjects who used low numbers for distance in meaning and high numbers for closeness in meaning fell into a group by themselves and an inspection of their data indicated that their responses were contrary to most of the other subjects. The scale reversal subjects were dropped from the subject pool since they had clearly not understood the instructions.

For the purposes of data analysis the semantic similarity ratings were standardized within subjects so that each subject had a mean of 5.0 and a standard deviation of 2.0 for his entire set of responses. This controls for individual differences in the perception of the scale as such, but preserves information on the relative differences among the pairs rated. The matrix of average ratings for each word pair provides an indication of the judged semantic distance between any pair of lexical items for the subject sample participating in the experiment. Small averages represent greater perceived similarity of meaning than large average ratings. Appendices D1 - D6 contain the pooled distance matrix for each of the lexical sets discussed in the next chapter. A matrix of standard deviations for each word pair is also provided. The maximum possible standard deviation is 4; this would be the result if one-half of the subjects rated a particular pair as a 1, and the other half provided a 9 rating.

Inter-subject distances can also be calculated by comparing the pattern of responses for pairs of subjects. The subject distances can then be analyzed to determine whether any subject groups, indicative of different strategies for doing the task, are present in the data.

Sorting Task

A card sorting task was designed to verify if meaning components similar to those obtained from the similarity ratings would appear from a quite different experimental task. The words from a lexical set were printed on separate cards and subjects were instructed to sort the cards into piles so that each group had some meaning element in common. Subjects were also asked to write down the features or characteristics they used as a basis for sorting, if they wished. These comments proved to be instructive and in many cases the subjects named exactly the same dimensions hypothesized for the semantic similarity ratings data. A sample set of instructions to the subjects for the sorting task is given in Appendix A2.

Card sorting requires categorical judgements. Often subjects must decide on one or two possible strategies and then stick to them, for example, sorting the stimuli into positive versus negative words. Presumably, the subjects sort in terms of the most salient dimensions and other, more subtle distinctions may be lost since subjects cannot indicate the degree to which they perceive a certain meaning component for a particular word. An analysis of sorting data often results in subject groups since different people find different underlying meaning components salient. Semantic similarity ratings allow for differential weights on salient dimensions; card sorting, on the other hand, requires a choice of the most salient components, often to the exclusion of others.

The decision whether to use the card sorting or ratings method of data gathering would depend on what kind of semantic information is desired from the lexical set used as stimuli. Both approaches give basically the same results, but the similarity ratings technique provides a more complete picture of the interrelationships of meaning within the set studied. The card sorting approach will allow larger lexical sets to be analyzed, so that a general overview of the meaning components of an extensive lexical set can be obtained.

Categorized data such as that obtained from card sorting can be analyzed using a "coincidence matrix" which shows, for any pair of items, whether or not they were sorted into the same group. The use of coincidence matrices for analyzing categorization data was suggested by Johnson (1968b) and developed by Baker (Baker & Derwing, 1982). A coincidence matrix was constructed for each subject for all possible pairwise (n(n-1)/2) comparison of terms. If two words were sorted into the same group by a particular subject a 1 was assigned to that pair of items, otherwise a 0 was entered into the matrix.

The distance between each pair of subjects can then be calculated by comparing each subject's matrix with all the others on a pairwise basis. The subjects' responses are compared element by element and the number of mismatches is tabulated and divided by the number of elements (n(n-1)/2). If two subjects provide exactly the same patterning (they sorted the words exactly the same way), there will be no mismatches and the distance between them will equal 0. If, on the other hand, a pair of subjects sorted in completely different ways they will have the maximum number of mismatches (n(n-1)/2) and the distance between them will be 1. The distance between any two subjects is thus a number between 1 and 0 which represents the proportion of times subject i and subject j did *not* sort a possible pair of objects into the same group. These matrices are important for discovering different subject strategies in responding to a particular lexical field. The analysis of subject groups is discussed in greater detail in the next section.

The same logic for finding inter-subject distances can be used for finding inter-object distances. The values in the object distance matrices represent the proportion of subjects who did *not* group a pair of terms together. This distance metric also ranges between 0 and 1; 0 indicates that all subjects using a particular strategy sorted two terms into the same group, while 1 means that none of the subjects placed a given pair of words in the same group. Distance matrices for objects are in Appendices D1 - D6. The distance matrix for objects is similar to the distance matrix obtained from the similarity ratings task in the sense that both types of matrices show how similar or close in meaning the subjects consider any pair of words to be. The distance metrics, however, are arrived at in very different ways and are based on different assumptions about the data.

Data Analysis

Subject Groups

Most studies in psycholinguistics are conducted under the assumption, generally implicit, that all subjects will and do respond in the same way. This was certainly true of the research reported in Chapter 3. The previous chapter has set forth the hypothesis that while meaning can have a conventional interpretation, each person can also respond somewhat differently. It must therefore, be assumed that not all subjects will respond exactly alike in a particular experiment. It is necessary to look for subject groups prior to an anaysis of the objects data. Subjects are usually pooled prior to the analysis of the objects, under the implicit assumption that averaging across subjects will take care of any subject variation. However, this procedure may also veil interesting and consistent differences among a subset of subjects. For this reason, the first step in the analysis of data from psycholinguistic research ought to be to look for subject groups since subjects may give different responses because they find different underlying meaning components salient. Data analytic techniques are available for this purpose and should not be ignored.

Looking for subject groups also provides a method for determing whether all of the subjects had understood the task and responded appropriately, since all subjects who respond in a similar way will be in one group. If a subset of subjects interpreted the instructions in a particular way, not necessarily intended by the experimenter, their data ought to reflect what they thought was expected of them. By examining for subject groups prior to data analysis it is less likely that the experimenter will make the mistake of assuming that all subjects have interpreted the instructions and stimuli in only one way.

Hierarchical clustering was used for discovering subject groups (Johnson, 1967; Wishart, 1978) in the present study. Hierarchical clustering programs take distance data as input so the subject distance matrices from the semantic similarity rating and card sorting tasks could be used as input for hierarchical clustering. The hierarchical clustering schema initially treats each subject as a separate cluster (Johnson's weak clustering), and then gradually builds a tree by grouping together people who respond similarily. The clusters become progressively larger until finally there is only one cluster including everybody

(Johnson's strong clustering). If the subjects had responded exactly alike they would form a single cluster. If they responded randomly, everyone giving a unique pattern of responses, the cluster links would build up gradually and the tree would resemble a pyramid. Figure 5.2 is an example of a hierarchical clustering solution where no subject groups are present. Contrast this with Figure 5.3 where subject groups are clearly represented.

There are few reliable statistical tests for deciding exactly how many significant groups there are in any given hierarchical clustering schema. Extensive randomization tests of semantic similarity distance data based on a nine point scale and using Ward's method for clustering have suggested that links below 5 for the "within cluster" error term are more homogeneous than would be expected by chance, while links above 18 are more heterogeneous than would be expected. These values were used as general cut-off points for deciding how may significant clusters are represented in a particular hierarchical clustering schema.

These general cut-off points are useful, but will not always provide information about how compact or distinctive a particular cluster is. Such a statistic can be calculated by comparing the mean "within cluster" distances to the mean

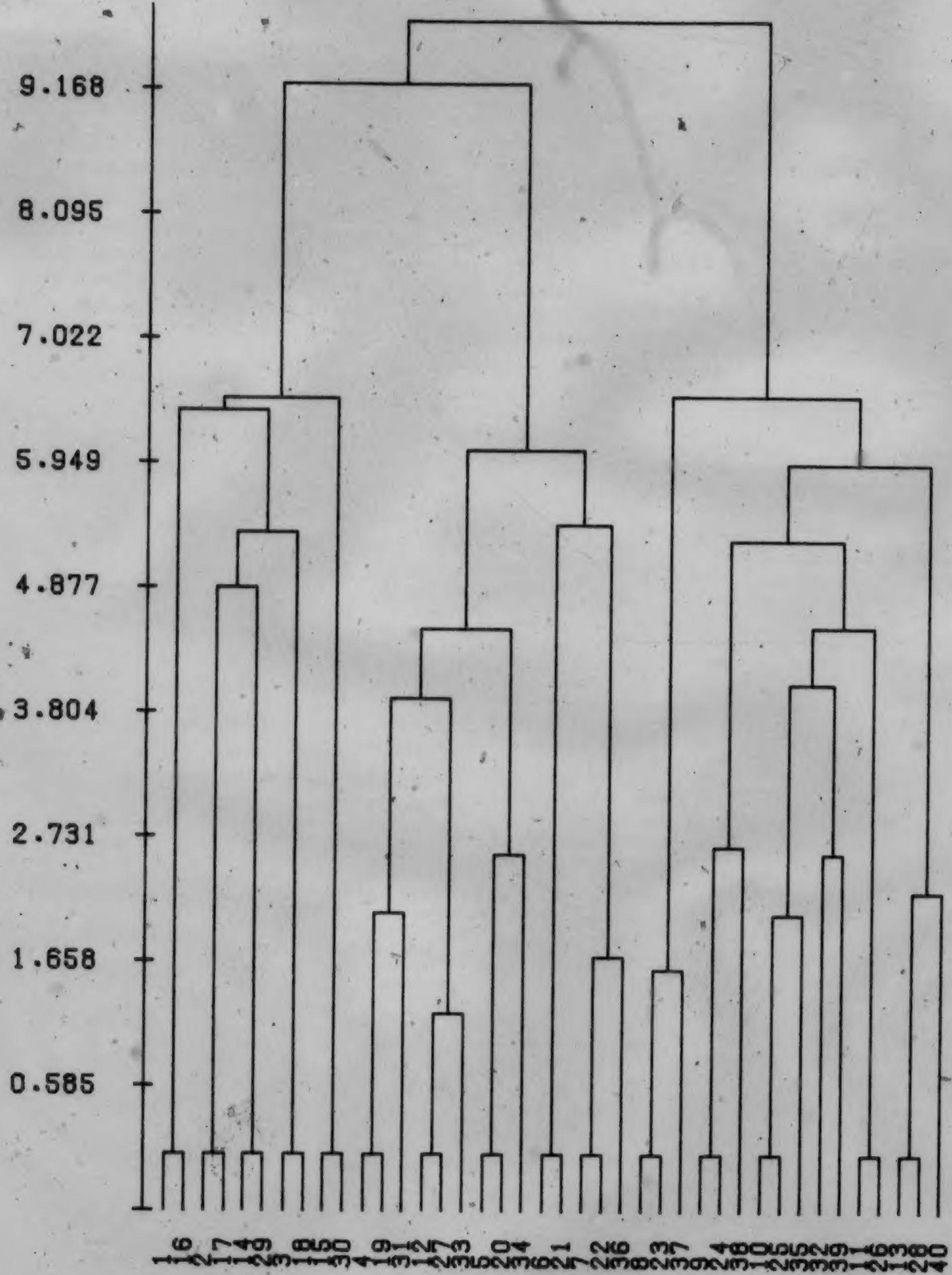

Figure 5.2. No Subject Groups for Emotion Terms - Ratings Task

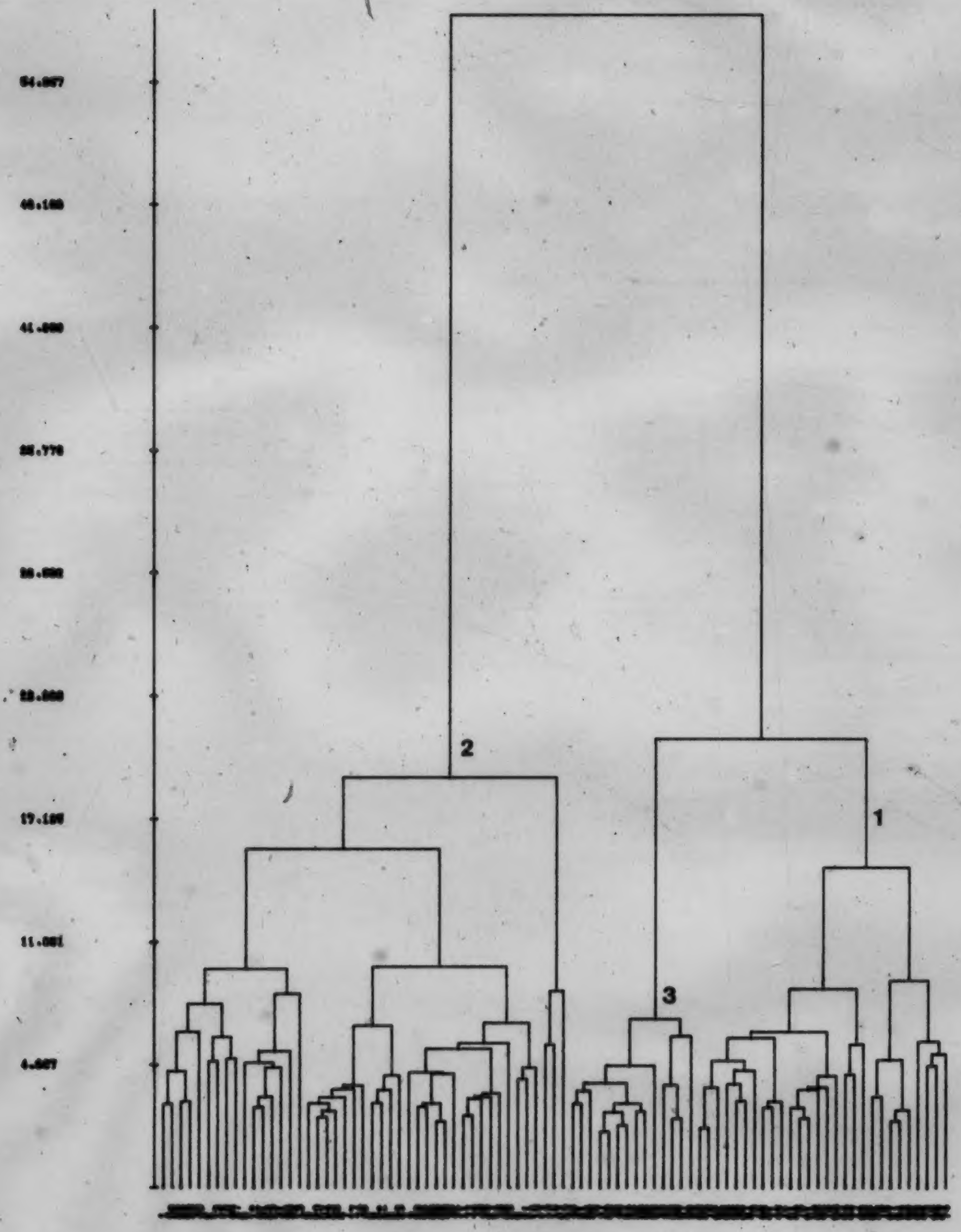

Figure 5.3. Three Subject Groups for Kinship Terms - Ratings Task

"between cluster" distances. If a cluster contains k elements, it will have k(k-1)/2 within cluster distances and k(n-k) distances between those elements within the cluster and the remaining distances in a set of size n.

A measure of distinctiveness (D) of a cluster (developed by Baker (Baker & Derwing, 1982)) compared to all other clusters in the same hierarchical clustering schema can be computed as 1 minus the ratio of mean "within" to mean "between" distances (D = 1 - W/B). If there is no distinction between a cluster and elements outside the cluster D = 0; if a cluster is clearly distinct D = 1. The distinctiveness statistic is very helpful in deciding on the number of significant subject groups for any set of data. The D values for the various clusters increases toward 1 as long as the clusters are distinct from each other. For example, the D statistics for 2 clusters might be .438 and .390. When the two clusters are further divided into three (the second cluster is the one affected), the Ds are .438, .541, and .511 for the same data. Clearly, when the second cluster is divided, the three resulting clusters are more distinct from each other than when only two clusters are compared. Interpretation of the D statistic would suggest that there are three rather than two distinct clusters for this set of data.

The Mann-Whitney U test (Hays, 1963; Siegel, 1956) is also useful for determining cluster distinctiveness. This non-parametric statistic is calculated by considering the rank order of distances for the clusters and comparing the mean ranks of within distances to the mean rank of between distances. For a sufficiently large n, the U statistic is expressed as a z-score which can be interpreted as a normal deviation score. The Mann-Whitney U test is sensitive to n and is non-significant when only a few items are present in a cluster; therefore, in the next chapter Mann-Whitney statistics are not reported for clusters with less than three members. Such small n's sometimes occur when the terms are analyzed using hierarchical clustering since the lexical sets tend to be small to begin with. In such cases the semantic interpretation of the terms is so obvious that there is little doubt that the terms form a coherent group, even though a Mann-Whitney U test cannot be performed for that group. In most other cases the Mann-Whitney statistic confirms the interpretation of the D statistic.

Johnson (1968a) also developed a cohesion statistic. The cohesion score is based on the means of what Johnson refers to as inner and middle distances which correspond to the within and between distances of the D statistic. In general, larger cohesion scores represent greater distinctiveness but there is no upper limit so it is difficult to compare scores from different clusters. Johnson's cohesion score is also very sensitive to n. It agreed with the D and Mann-Whitney tests but was not found to be useful for deciding on the number of significant clusters in an analysis, therefore, only the D and Mann-Whitney U test for the various subject groups are reported in the next chapter.

When the hierarchical clustering schema did not appear to show any subject groups the D and Mann-Whitney statistics were calculated for a hypothetical two-subject-groups case. If these statistics were not significant for two subject groups it would seem safe to assume that the subjects were homogeneous in their responses. Occasionally, the two statistics disagreed. In these cases the decision for one or two groups was formulated by considering the D statistic and a subjective impression from the hierarchical schema. The data were not considered to show two or more subject groups unless both the hierarchical clustering schema and distinctiveness statistics clearly indicated this assumption was warranted

Terms Analysis

Once it has been decided whether or not subject groups are represented, the structuring of terms can be anlayzed for each subject group individually. The data were divided according to the respective subject groups and were then analyzed using one of the techniques described in this chapter. The mathematical assumptions for hierarchical clustering and multidimensional scaling are met by both the semantic similarity and sorting distance matrices, so that either method could be used for data analysis. The choice of one technique over the other depends on whether a dimensional or clustering solution is desired.

Subjects performing the sorting task were required to make categorical judgements in grouping the terms. It is therefore unlikely for continuous dimensions to emerge from sorting data. The assumptions for conducting multidimensional scaling are met by the sorting distance matrices and, in theory, a multidimensional scaling could be performed on these data. When this is done, however, the data fall into tight clusters, making a dimensional interpretation difficult, so that for practical considerations, multidimensional scaling is usually not appropriate for the sorting data which tend to have discrete components rather than continous underlying dimensions (Shepard, 1974). Therefore, hierarchical clustering was used to analyze data from the sorting task rather than multidimensional scaling. The logic behind hierarchical clustering has already been explained in the previous section.

The semantic similarity ratings task requires subjects to make continuous or graded judgements. The nine point scale was used to allow for a number of fine distinctions in the similarity of meaning scale. Ratings data are compatible with either a multidimensional scaling or hierarchical clustering analysis since they can reveal either dimensional or hierarchic structure. In most cases, the data seemed to reveal continuous dimensions rather than discrete components, so multidimensional scaling was preferred for analyzing similarity ratings data. Multidimensional scaling analyses attempt to reduce the underlying dimensions to the smallest number giving the best structural description of the inter-object distances (Romney, Shepard, & Nerlove, 1972).

Multidimensional scaling methods operate on similarity or dissimilarity matrices. The analysis is based on the assumption that the similarity ratings are related to distances in some psychological space. Multidimensional scaling computer programs attempt to reduce the dimensionality of the psychological space so that a maximum proportion of variance is accounted for by a minimum number of dimensions. The experimenter must then interpret and label these dimensions.

The Individual Differences Scaling (INDSCAL) version of multidimensional scaling was used to analyze the semantic similarity ratings (Carroll, 1972; Wish, Deutsch, & Biener, 1972; Wish & Carroll, 1974). INDSCAL differs from other multidimensional scaling analyses in that it assigns a relative weight for the salience of each dimension for each subject. These weights can provide some information about differences among the subjects.

It was not always the case that multidimensional scaling was the appropriate technique for analyzing the similarity ratings data. Shepard (1974) discusses the difficulties involved in using multidimensional scaling when the underlying structure is categorical. If the multidimensional scaling configuration seems to produce tight clusters rather than continuous dimensions, the hierarchical clustering solution is probably more appropriate for the data, as when the data come from a sorting task. It was often the case that an overwhelming categorical distinction masked or swamped underlying dimensions. This was especially true with the evaluative sets, where a good - bad categorical judgement tended to divide the data into two distinct clusters rather than a continuous underlying dimension.

In the next chapter results for similarity ratings data are presented as either multidimensional scaling or hierarchical clustering representations. The solutions from both methods of analysis were considered and the one offering the clearest interpretation of the data was finally chosen for presentation. At no time, though, were the two solutions inconsistent with each other.

Conclusion

This chapter has presented the data gathering and analytic techniques used for investigating the semantic interrelationships within lexical fields. The results obtained using these techniques are presented in the next chapter. For each hierarchical clustering solution the Distinctiveness and Mann-Whitney statistics are also reported, except for cases where a cluster had less than three members. Appendix B presents the hierarchical clustering solutions for the subject groups, and Appendix C contains the object clusterings.

CHAPTER 6

EMPIRICAL EVIDENCE FOR FRAMES OF REFERENCE

Introduction

Chapter 4 hypothesized that subjects may use different frames of reference to judge the meanings of lexical items. This chapter presents results in support of that hypothesis. Emotion terms and interpersonal verbs illustrate the evaluative frame, tools and furniture words represent concrete lexical sets, and kinship terms and pronouns provide evidence for the social frame of reference. The data gathering and analytic techniques used for each study have already been explained in the previous chapter. Instructions to the subjects as well as the distance data for each lexical set can be found in Appendices A1 to A2 and D1 to D6 respectively. To preserve the continuity of this chapter the hierarchical clustering graphs are presented in Appendices B and C. The hierarchical clustering solution for subjects is in Appendix B and the object clustering solutions may be found in Appendix C. All subjects in the following experiments were native speakers of English.

Figures and Tables are labeled according to whether the data were obtained using the ratings or sorting method. For example, "Tools terms clusters: Sorting Group 2", indicates that the results represented come from one of the subject groups which used the card sorting method for judging tools words; a "Ratings Group" indicates that the data were obtained by semantic similarity ratings judgements.

Multidimensional scaling solutions produce dimensions and hierarchical clustering solutions result in partitioned sets of items; in the following discussion, the terms *dimension* and *cluster* will be used in a technical sense to refer to the output from these particular analyses. As stated in the previous chapter the choice of multidimensional scaling or hierarchical clustering for analyzing a particular lexical set depended on the type of data used as input and ease of interpretation of the results. No implication should be drawn that a lexical field has an underlying categorical or dimensional structure because a particular type of analysis was used. For the prounouns set both multidimensional scaling and hierarchical clustering solutions are presented, and it can be seen that they provide similar results.

The multivariate statistical techniques are strictly approaches to data analysis; they do not necessarily reveal psychological constructs. The term *meaning component* will be used for those aspects of the meaning of a word which are psychologically salient to the subjects. A meaning component is unspecified as to its exact form and is not tied to any particular type of statistical analysis. For example, *generation* is a meaning component of kinship terms revealed by both multidimensional scaling and hierarchical clustering.

This chapter has three main sections, one for each of the three frames of reference by which the data were interpreted. Each section ends with a speculative discussion about that frame of reference. Within each major section two studies are reported. Each study begins with a brief literature review of previous work with that particular lexical field. Some fields, such as emotion and kinship terms, have been studied more than others and have a correspondingly longer literature review. For each lexical set, the semantic similarity results are reported first and, if there were any, the sorting data are reported next. Finally, each study ends with a comparison of results from the ratings and sorting studies.

The results from the sorting and semantic similarity ratings tasks are compared using the Chi-squared test of independence among the clusters discovered for each pair of subject groups. Since there were many empty cells in the contingency tables the Chi-squared statistics reported should only be considered as a rough guide to the degree of dependence between two subject groups. The contingency tables for each comparison are provided and, in most cases, the relationship between ratings and sorting subjects is readily apparent from these tables.

For some data sets most of the subjects did perceive similar distances between individual pairs of items so that a strong correlation resulted at the level of the original pairwise distances. This would suggest that the two subject groups organized the words in a highly similar manner, regardless of the task performed. In these cases, the Spearman rank order correlation coefficient, a non-parametric statistic, is reported as additional evidence for a relationship between two subject groups. The Spearman rho is used because data resulting from the two tasks are not normally distributed. The distributions for the distance matrices appear to have a negative skew, indicating that statistics which assume a normal distribution are inappropriate for analyzing the data.

Evaluative Frames of Reference

Evaluative frames of reference are used for lexical sets which refer to people's judgements of situations, usually involving other people. The most prominent underlying dimension of lexical fields which require an evaluative frame of reference is the *positive-negative* meaning component since this is the most fundamental judgement humans make about their experiences and their environment.

Emotion Terms

Emotion names, like all words, are assumed to have meaning components which are distinct from their connotative or affective aspects. Most studies have been based on the assumption that the researchers were investigating the connotative character of emotions. This author will argue that for emotions the distinction between connotation and the meaning of an emotion is by no means clear cut. What is the meaning of an emotion if it is not some kind of evaluative response to the experience of that emotion?

The meaning of an emotion can only be the internal experience evoked by a situation. This seems to imply that it should be impossible to study feelings since an individual's emotional experiences are unique to him, but such a statement ignores the social aspect of emotions. Those emotions which have labels are those which are generally expressed in social contexts; either to describe one's inner feelings or one's evaluations of others. There are, no doubt, emotions which are unique for certain people, but the labels for many emotions are shared. As long as people are consistent in labeling a particular type of personal experience, they will be able to communicate with others who recognize that certain behavior accompanies an emotion label. Wierzbicka (1972) has attempted to represent the meanings of emotions by describing the type of situation which is likely to evoke a particular emotion. This strongly suggests that the shared meaning components of emotion words involve knowing the kinds of situations in which one would feel certain emotions. The shared nature of emotions has been indicated by numerous studies where subjects have been able to produce consistent responses to emotion names.

Most emotion studies have used some kind of scaling or similarity rating task. Abelson and Sermat (1962) found five dimensions; three were "uninterpretable", and the other two strongly correlated with the *a priori* scales used by

Schlosberg (1954). Dimension I correlated .947 with Schlosberg's *pleasant-unpleasant* scale, and Dimension II correlated with both the *attention-rejection* (r = .878) and *sleep-tension* (r = .917) scales.

Osgood (1966a) used live actors to express emotions which were labeled by the subjects. He found three dimensions: Pleasantness, Activation, and Control. Three similar factors were discovered by Block (1957) from a semantic differential rating of emotion names. These factors were labeled Unpleasantness, Activation, and a unipolar factor representing "interpersonal relatedness and considerations of impermanence."

Fillenbaum and Rapoport (1971) also investigated the domain of emotion terms. They used Hebrew stimuli and Hebrew speaking subjects but they interpreted their results as if they were valid for English emotion terms. Their analyses did not show much beyond the pleasant-unpleasant dimension. Fillenbaum and Rapoport complain that their subjects may have been producing idiosyncratic judgements of emotions. Under the circumstances of their study it is hardly surprising that their results were inconsistent. Israel has a heterogeneous population with people immigrating there from all over the world. The discrepancies in Fillenbaum and Rapoport's data could result from cultural differences. Furthermore, the authors do not state how many of the subjects were native speakers of Hebrew. It is quite likely that Hebrew was a second language for most of their subjects. It is a serious mistake to ignore cultural and linguistic background in a semantic study as Fillenbaum and Rapoport have done.

In all of the studies just reviewed the pleasant-unpleasant evaluative meaning component has consistently appeared. Activation has occurred quite often and a third, less easily named dimension also appears. The three experimentally discovered components seem to correspond to Osgood's semantic differential results, the Evaluative, Potency and Activity dimensions. They also resemble Wundt's (1907) three aspects of feeling: pleasurable-unpleasurable, exciting-quieting, and relaxation-tension.

One other fact about emotion terms has been mentioned by several authors (Osgood, 1966a; Wundt, 1907). Names for unpleasant emotions appear to outnumber those for pleasant emotions. "This may be due either to an actual superiority in the number of unpleasurable forms of emotions, or it may be due to the fact that unpleasurable experiences attract a higher degree of attention" (Wundt, 1907, p. 200). In the experiments reported below it is also the case that unpleasant emotion terms outnumber the pleasant ones on the stimulus list.

Emotions Similarity Ratings Study

Subjects. Forty-six volunteers from an introductory linguistics course served as subjects. Six subjects were later eliminated from the sample because they provided a rating of 8 or 9 more than 50% of the time. This left data from 38 females and 2 males available for analysis.[1]

Stimuli. The stimuli were twenty-one emotion words, some from the set used by Fillenbaum and Rapoport (1971); the rest were chosen from Roget's Thesaurus. A complete list of terms is given in Figures 6.1 and 6.2.

Results. The hierarchical clustering of subjects shown in the previous chapter in Figure 5.2 indicates that the subject pool was quite homogeneous. The interpretation of no subject groups is supported by the Distinctiveness and Mann-Whitney tests of cluster cohesion for two clusters, assuming, hypothetically, two subject groups. The D's are close to zero, and the Mann-Whitney statistics are non-significant. In fact, subject responses were remarkably

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[1] These data were collected by Barbara Ewert.

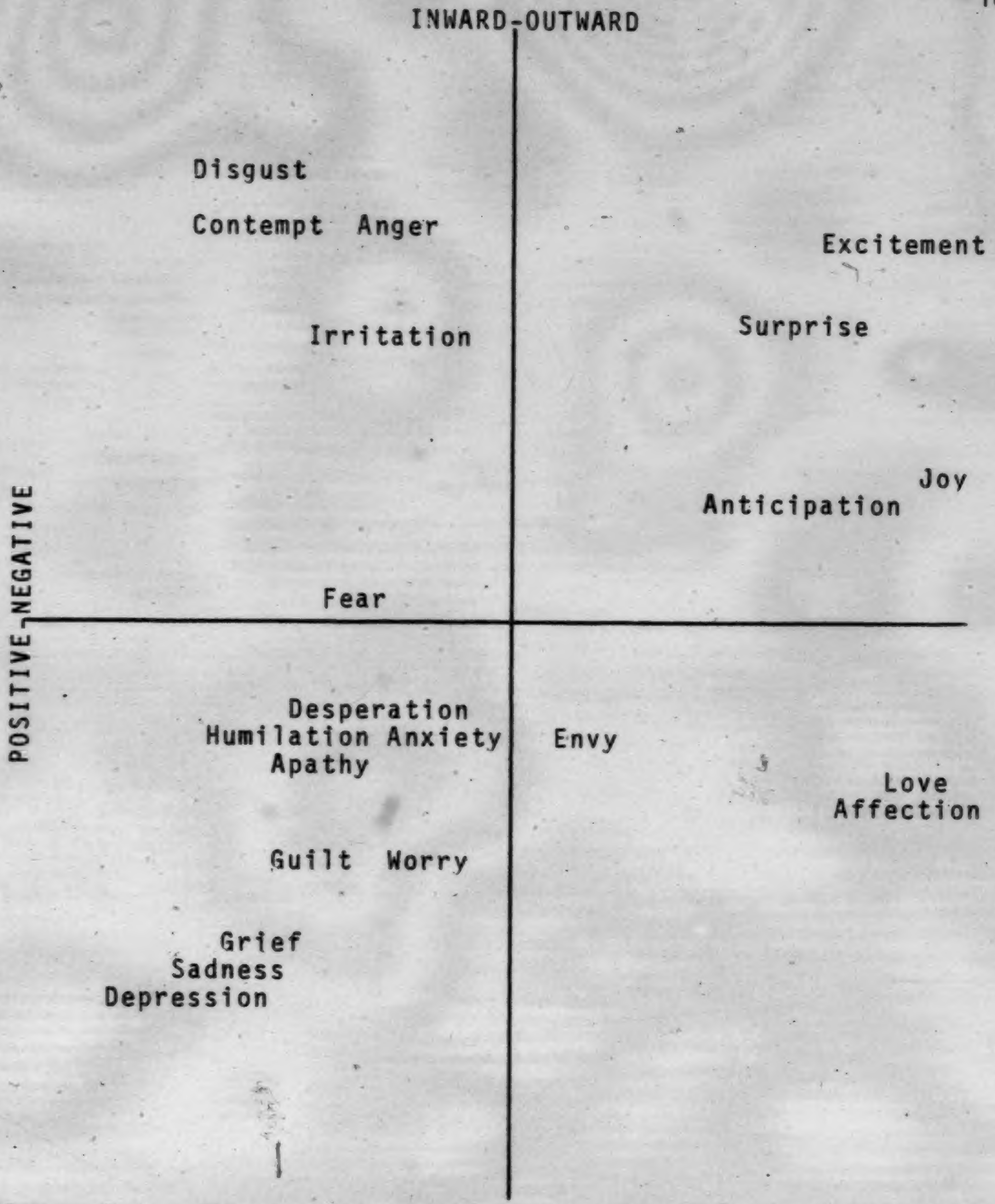

Figure 6.1. Emotion Terms - Positive-Negative and Inward-Outward Dimensions

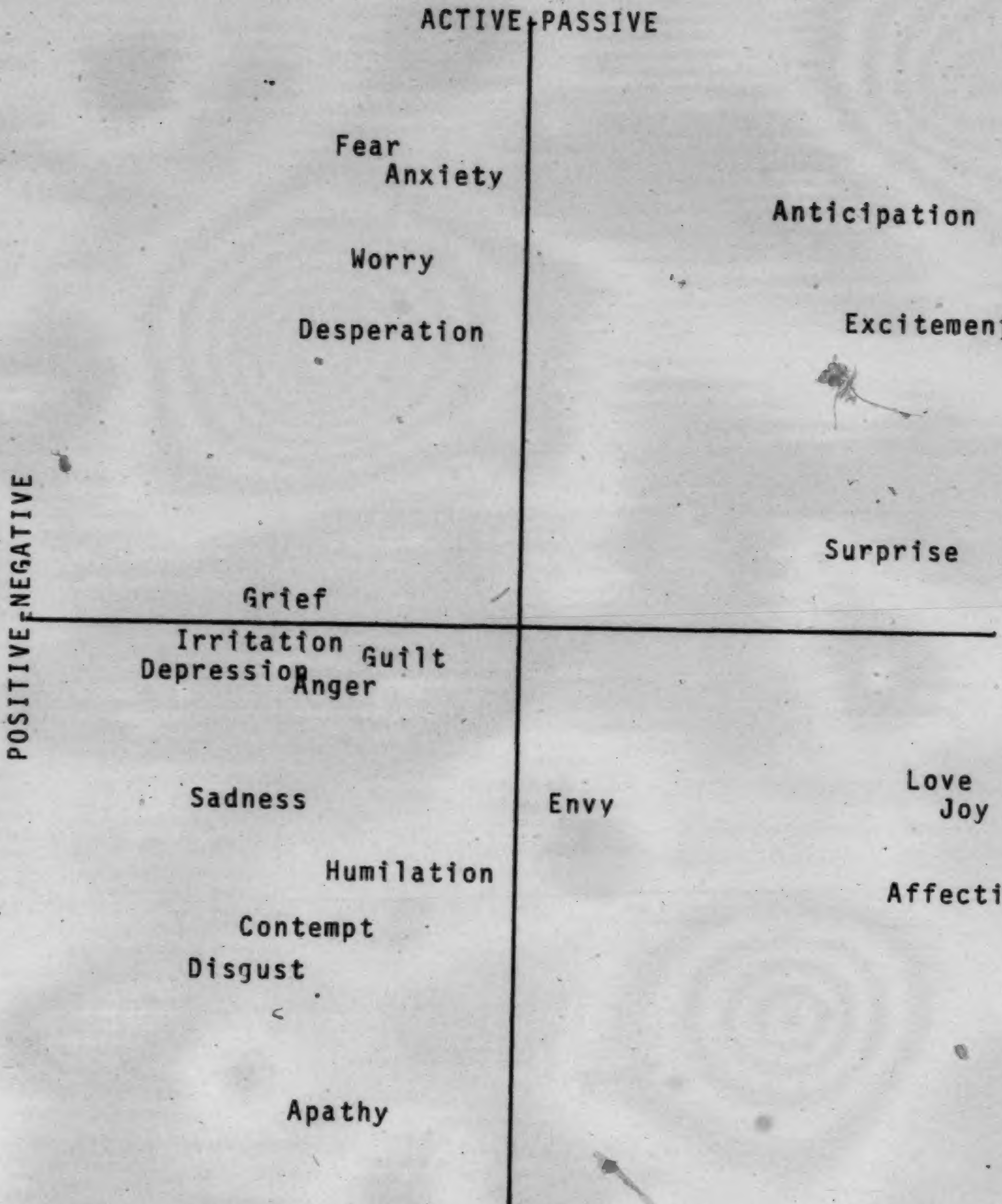

Figure 6.2. Emotion Terms - Positive-Negative and Passive-Active Dimensions

consistent for all studies with emotion terms.

The semantic similarity ratings were pooled across subjects. The pooled means and standard deviations for emotion terms similarity ratings may be found in Appendix D1. Figures 6.1 and 6.2 show the three interpretable dimensions which resulted from the multidimensional scaling analysis of the data. Dimension I separates positive from negative emotion terms. As in other studies, there were more negative than positive words.

Dimension II was interpreted as an inward-outward dimension. Outward terms represent emotions directed toward or caused by someone or something other than self. Inward emotions are those one keeps to oneself. *Love* and *affection* were considered to be somewhat inward by the subjects; perhaps because these emotions usually represent internal continuing states.

Dimension III organizes the emotion terms along a passive-active dimension. Active terms represent emotions which require an expenditure of energy and possibly a burst of adrenaline (as in *fear*). In other words, some state of arousal on the part of the individual feeling the emotion. *Apathy* is the most passive emotion and requires no energy

TABLE 6.1

EMOTION TERMS CLUSTERS - SORTING STUDY

Clusters	D	M-W
Positive		
Passive: Affection, Love, Joy	.826	3.068**
Active: Anticipation, Excitement, Surprise	.807	2.905**
Negative		
Outward: Anger, Irritation, Contempt, Envy	.561	4.045***
Inward-Active: Guilt, Worry, Fear, Desperation, Anxiety, Humiliation	.327	5.077***
Inward-Passive: Apathy, Depression, Grief, Sadness	.661	4.040***

* = .05 ** = .01 *** = .001 level of significance

output from the apathetic person.

Emotions Sorting Study

Subjects. Subjects were students enrolled in an introductory psychology course. They received course credit for their participation. There were 26 females and 32 males giving a total of 58 subjects. They ranged in age from 18 to 34 years.

Stimuli. The same set of emotion terms used in the similarity ratings experiment were used as stimuli in this study. Unfortunately, *disgust* was inadvertently left out of the stimulus set due to an oversight. This did not present any serious problems in the analysis of results, however, since the original set was heavily weighted in favor of negative emotions.

Results. The D and Mann-Whitney statistics were calculated for a hypothetical two subject groups case, to see if the data might contain subject groups. Distinctiveness is close to 0 and the Mann-Whitney z-score is only significant at the .05 level, supporting an interpretation of no subject groups.

The hierarchical clustering of stimuli was then based on the data pooled across subjects. The results indicated five significant clusters. A summary of the cluster statistics is presented in Table 6.1; as with the similarity ratings task, the major distinction is between positive and negative emotions. The positive terms are divided into two distinct groups, active versus passive emotions. The negative emotions fall into three groups; outward emotions, inward-passive (introspective) emotions, and inward-active emotions.

Some of the subjects commented on their sorting strategies and most of those who volunteered information mentioned the distinction between positive and negative emotions. A few subjects also indicated the active-passive distinction calling it "state of arousal" versus "calm, slow feelings." One subject differentiated between emotions which relate to circumstances : *surprise, excitement, anticipation, fear, anxiety, worry, apathy, desperation, guilt,* and those which relate to people: *love, joy, affection, envy, irritation, anger,* and *contempt.* For this subject *depression, grief, humiliation,* and *sadness* were emotions related to oneself (inward).

Comparison of Rating and Sorting Experiments

Subjects in both experiments appeared to be using the same meaning components for the emotion terms, even though different tasks and different subjects were involved in each case. The positive-negative distinction is an especially salient meaning component. Figure 6.3, the contingency table for ratings and sorting clusterings, was formulated from the hierarchical clustering solutions obtained for each data set since dimensions cannot be directly compared with discrete clusters. The Chi-squared test of independence between the two groups was significant beyond the .001

EMOTION TERMS

Sorting Group	Ratings Group: POSITIVE	NEGATIVE OUTWARD	NEGATIVE ACTIVE	NEGATIVE PASSIVE
POSITIVE PASSIVE	Affection Love Joy			
POSITIVE ACTIVE	Anticipation Excitement			
NEGATIVE OUTWARD		Anger Irritation Contempt	Envy	
NEGATIVE INWARD ACTIVE			Guilt Worry Fear Desperation Anxiety Humilation	
NEGATIVE INWARD PASSIVE				Apathy Depression Grief Sadness

Chi-squared = 38.58; significant at .001 level

Figure 6.3. Emotion Terms - Comparison of Ratings With Sorting Subjects

level.

The distance data from the ratings and sorting experiments also correlate strongly, rho = .8426, suggesting that both sets of subjects perceived similar components in the emotions lexical set. This correlation coefficient is particularly impressive when it is noted that it was arrived at by comparing the distances between individual pairs of items for the two groups of subjects. The strong correlation suggests that the ratings and sorting subjects were responding in very similar ways.

Interpersonal Verbs

Interpersonal verbs refer to relationships between people. Osgood (1970) has studied a set of these verbs in some detail. He hypothesized ten *a priori* meaning features which were later verified by a semantic differential type study. Osgood's features were associative-dissociative, initiating-reacting, ego oriented-alter oriented, supraordinate-subordinate, terminal-interminal, future-past, delibrate-impulsive, moral-immoral, potent-impotent, and active-passive. The last three features were derived from Evaluation, Potency, and Activity respectively, since Osgood assumed, with some justification, that these three affective dimensions might have some relevance for interpersonal relations.

One of the aims of the following experiment was to determine whether Osgood's analysis of interpersonal verbs based on the semantic interaction technique could be verified using the semantic similarity ratings method. There is no sorting study using interpersonal verbs as stimuli; instead, the results from the ratings data are compared with Osgood's results.

Interpersonal Verbs Similarity Ratings Study

Subjects. Introductory psychology students participated for course credit. Three subjects were dropped for using a rating of 8 or 9 more than 50% of the time. One other subject was dropped because he reversed the values of the rating scale halfway through the task. This left 32 males and 13 females, 17 to 28 years old.

Stimuli. The stimuli were taken from the set of interpersonal verbs investigated by Osgood (1970). Subjects in Osgood's experiment used his *a priori* features as rating scales in a semantic differential task. Eight factors resulted from an analysis of the ratings (Osgood's Table 6). The stimuli for the similarity ratings study were those verbs with the highest loadings on each factor. A complete list of stimuli is given in Figure 6.4 and Table 6.2. Subjects were told that the set of words were "describing interpersonal relations."

Results. The hierarchical clustering of subjects indicated that no subject groups were present in the data. The D and Mann-Whitney statistics for two groups support this interpretation.

The hierarchical clustering schema of terms suggested five clusters. These clusters and their distinctiveness statistics are shown in Table 6.2. The major division is between positive and negative verbs. The positive verbs are divided into two groups, verbs of helping, and compliance verbs. The negative verbs fall into three groups; harmful actions, verbs of chicanery, and verbs of defiance.

A contingency table (Figure 6.4) of Osgood's (1970) eight factors of interpersonal verbs and the five hierarchical clusters just reported was calculated. The Chi-squared test of independence was significant at the .01 level, suggesting that some of the hierarchical clusters do correspond to Osgood's factors. Words in the harm and chicanery clusters are immoral, dissociative, initiating, and deliberate

TABLE 6.2

INTERPERSONAL VERBS CLUSTERS

Clusters	D	M-W
Negative		
Harmful: Molest, Ambush, Seduce	.433	2.645**
Chicanery: Betray, Cheat, Confuse	.376	2.109*
Defiance: Resist, Defy, Compete With, Have Contempt, Disregard	.371	4.167***
Positive		
Help: Advise, Console, Reassure, Be Attentive, Confess to, Confide in	.484	5.655***
Compliance: Reform, Promise, Obey, Be Submissive	.338	3.070**

* = .05   ** = .01   *** = .001   level of significance

according to Osgood's *a priori* features. Items in the resist cluster are coded dissociative, reacting, alter oriented, and interminal by Osgood. He named this factor dynamism. The verbs of helping are moral and associative, and weight most strongly on the ego-alter factor. The compliance verbs are impotent, reacting, and subordinate. The words in this cluster are spread over several of Osgood's factors.

Osgood's features were determined *a priori* and verified using the semantic interaction technique. This method of data gathering has already been criticized in Chapter 3. The semantic similarity ratings method has shown itself to be an easier and more consistent technique for discovering the underlying meaning components of interpersonal verbs than the semantic interaction technique.

Discussion of the Evaluative Frame

Both studies reported above have revealed a strong positive-negative meaning component underlying the lexical sets. In addition, the emotion terms study was replicated using two different experimental techniques. The emotion terms and interpersonal verbs studies have also supported previous research with the same sets of terms, so that there is strong evidence that the positive-negative meaning component is psychologically salient.

Why is evaluation so dominant? Recent theories have attempted to explain this by assigning affective evaluations to a genetically determined pre-cognitive system (Osgood, 1969; Lyons, 1980; Zajonc, 1980). Zajonc (1980), following Wundt, states that all cognitions are preceded or accompanied by affective judgements, which are inescapable (we

INTERPERSONAL VERBS

Ratings Clusters

	NEGATIVE			POSITIVE	
	HARM	CHICANERY	RESIST	HELP	COMPLY
Osgood's Factors					
F I	Molest Ambush Seduce	Betray Cheat			
F II			Resist Defy Have Contempt Compete With		
F III				Advise Console Reassure	Reform
F IV				Be Attentive	Be Submissive
F V				Confess Confide	
F VI			Disregard		Obey
F VII		Confuse			
F VIII					Promise

Chi-squared = 51.513; significant at .01 level

F I - Associative/Dissociative Moral/Immoral Impulsive/Delibrate
F II - Dynamism (Active/Passive Potent/Impotent)
F III - Ego/Alter
F IV - Supraordinate/Subordinate
F V - Terminal, Past, Associative
F VI - Supraordinate, Past, Dissociative
F VII - Initiating/Reacting
F VIII - Future/Past

Figure 6.4. Interpersonal Verbs - Comparison of Ratings Data With Osgood's Factors

cannot control what emotions we feel, only their overt expression), and irrevocable (Lyons, 1980; Zajonc, 1980). As Osgood (1969) has noted, it was probably important for the evolution of our species to recognize good from bad, quick from slow, and strong from weak.

There is experimental evidence in support of the view that people make evaluative judgements in a manner different from other kinds of judgements. Zajonc (1980) reports some experiments where subjects could make preference judgements for stimuli even when they could not reliably identify the semantic or physical characteristics of words. Cross-culturally, the Evaluative dimension consistently occurs from semantic differential ratings (Osgood, 1962; Osgood, May, & Miron, 1975). This should not be surprising since the concepts labeled by evaluative lexical items are those most likely to express essential human activities, and are least likely to be sensitive to cultural differences.

The evidence suggests that affective judgements are a basic human response which can be elicited by all sorts of stimuli. Some lexical items, however, refer to events which have a strong affective component. The two lexical sets presented above are of this nature. They involve a person's interactions with others and his reactions to those interactions. The most immediate evaluation which one makes is good-bad. Other meaning components appear to be unique to the particular lexical set studied, although the active component is also likely to occur. Evaluative lexical sets involve an internal perspective as an inherent part of their meaning. Emotion terms, in particular, seem to be the quintessential evaluative lexical domain. Other lexical fields which should follow the pattern of evaluative lexical items are verbs of judging (Fillmore, 1969; Marckworth, et al., 1981), good - bad terms (Fillenbaum & Rapoport, 1971), and, possibly, sets such as manner of speaking verbs (Zwicky, 1971). The first two sets contain words directly referring to evaluations, while the last lexical field refers to interactions among people.

The major characteristic of the evaluative frame of reference is that it is used for interpersonal relations which can be judged on a positive-negative basis. The amount of activation, and the orientation of the experiences (Osgood's ego-alter feature) are also important.

Concrete Frame of Reference

The concrete-abstract distinction is probably one of the oldest semantic distinctions proposed for lexical items.

TABLE 6.3

TOOLS TERMS CLUSTERS - RATINGS STUDY

Clusters	D	M-W
Tools		
Garden: Hoe, Shovel, Rake	.676	2.902**
Shop: Hammer, Chisel, Saw, Drill, Nail	.456	4.863***
Fastening: Clamp, Wire	.595	.....
Brushes: Whisk, Brush	.692	.....
Substances		
Sticky: Glue, Cement, Plaster	.646	2.896**
Spread: Oil, Grease, Paint, Wax, Varnish, Polish	.606	6.113***

* = .05   ** = .01   *** = .001   level of significance

Certainly, there seems to be a qualitative difference between objects which we can see, touch, and taste, and experiences of a more abstract nature. Concrete lexical items are the first type of words learned by children (Maratsos, 1979), which suggests that subjects in lexical semantic experiments should be most familiar with categorizing the referents of concrete lexemes. Semantic similarity rating and card sorting experiments have revealed that sets of concrete lexical items are judged differently than other types of lexical items.

Tools and furniture terms were the lexical sets used to investigate the concrete frame of reference. Both of these sets were studied by Rosch (Rosch, et al., 1976; Rosch & Mervis, 1975) whose work has been discussed in Chapter 3. Almost all of Rosch's work with categorization has been with concrete lexical sets. Rosch has found that when subjects are asked to list the attributes of concrete objects they usually listed both physical and functional attributes. These types of meaning components were also revealed in the following two studies.

Tools Similarity Ratings Study

Subjects. Sixteen members (staff and students) of the Linguistics Department at the University of Alberta volunteered for this study. Four were later dropped for providing a 9 rating more than 50% of the time. This left one male and 11 females, 19 to 29 years old, available for analysis.

Stimuli. Twenty-one tools and household substances (*glue, polish*) were chosen as stimuli. A complete list is in Table 6.3. The distinction between objects and substances was deliberately built into the stimulus set to determine whether subjects would see it as a significant component. The list of terms was potentially ambiguous, since the words could be interpreted as either nouns or verbs. The sentence frame "They used the ___" was used to restrict the interpretation of terms to nouns.

Results. In the hierarchical clustering schema for the subjects, almost all of the links are below 5, indicating that the subject pool was very homogeneous. It was not possible to calculate D and Mann-Whitney statistics for a hypothetical two group case because Group 2 would have only had one member, and these statistics require at least three members in each group.

Table 6.5 contains the D and Mann-Whitney statistics for each cluster resulting from an analysis of the terms. As expected, there was a major division between tools and substances. The substances were further divided into two clusters, things used to stick things together, and things which are spread or painted on. Tools were divided into four distinct clusters: garden tools, shop tools, fastening tools, and brushes.

TABLE 6.4

TOOLS TERMS SUBJECT GROUPS

Sorting Subjects	D	M-W
Group 1 N=11	.235	5.383***
Group 2 N=41	.330	21.967***
Group 3 N=7	.654	7.230***

* = .05 ** = .01 *** = .001 level of significance

Tools Sorting Study

Subjects. The subjects were introductory psychology students participating for course credit. A total of 59 subjects, 33 males and 26 females performed the task. They were 18 to 34 years old.

Stimuli. The same 21 terms used in the ratings task were stimuli for the sorting experiment. Subjects were not provided with the sentence frame but they were told that the words all referred to nouns.

Results. The hierarchial clustering solution suggested three subject groups. This is supported by the D and Mann-Whitney statistics presented in Table 6.4.

Group 1 produced five distinct clusters shown in Table 6.5. There were four females and seven males in this group. Cluster 1 corresponded to tools with shop and garden tools grouped together. The next major distinction was for items which hold things together. This was broken into two separate clusters, sticky substances and fastening tools. The last two clusters represent the spreading substances, oily ones versus more viscous liquids which are spread.

Group 2 subjects (24 males, 17 females) provided a major distinction between shop and garden tools. Table 6.5 shows Group 2 clusters. Brushes form one cluster, and then shop and garden tools are differentiated. The three clusters for substances are similar to those of Group 1; sticky substances, oily ones, and those which are spread or painted.

Group 3 also produced five clusters but they categorized the substances together and differentiated among the tools. Table 6.5 shows that Group 3 subjects perceived virtually no differences among substances. Tools were

TABLE 6.5

TOOLS TERMS CLUSTERS - SORTING GROUPS

Clusters	D	M-W
Group 1		
Tools: Brush, Rake, Whisk, Chisel, Drill, Hammer, Hoe, Saw, Shovel	.858	9.236***
Fasteners		
Sticky: Cement, Plaster, Glue	.726	2.994**
Tools: Clamp, Nail, Wire	.606	2.702**
Substances		
Oily: Grease, Oil	.901	.....
Spread: Paint, Varnish, Wax, Polish	.799	4.223***
Group 2		
Shop		
Tools: Chisel, Drill, Saw, Wire, Hammer, Nail, Clamp	.620	7.322***
Outside		
Garden: Hoe, Rake, Shovel	.950	3.169***
Brush: Brush, Whisk	.500	.....
Sticky: Cement, Plaster, Glue	.713	2.932**
Oily: Grease, Oil	.920	.....
Spread: Paint, Polish, Wax, Varnish	.801	4.188***
Group 3		
Substances: Cement, Glue, Grease, Oil, Paint, Plaster, Polish, Wax Varnish,	1.00	10.438***
Tools		
Brushes: Brush, Whisk	1.00	2.155*
Shop: Chisel, Drill, Hammer, Saw, Clamp	.692	7.042***
Garden: Hoe, Rake, Shovel	1.00	4.568***
Fastening: Nail, Wire	.692	1.949*

sorted into garden tools, shop tools, brushes, and fasteners. Group 3 consisted of five females and two males.

Comparison of Rating and Sorting Experiments

The Chi-squared test of independence was significant for each of the three sorting subject groups when compared with the ratings subjects. Figures 6.5 to 6.7 show the contingency tables for the comparison of each of the sorting groups with the ratings subjects. Each subject group saw the distinction between tools and substances but they perceived different subclusters within these two main categories.

The fact that each of the sorting groups responded in a manner consistent with the ratings subjects supports the claim that the ratings task allows for more different kinds of distinctions than the sorting task. In the tools experiment the sorting subjects had to decide upon a basis of categorization and then remain consistent, while the ratings subjects could consider all possible relationships for each word pair individually. Many subjects in the ratings task, for example, gave the pair *oil - drill* a rather high similarity rating (mean rating = 5.83, sd = 1.90). All of these subjects were living in Alberta where the association

TOOLS TERMS

	Ratings Group					
	TOOLS				SUBSTANCE	
	GARDEN	SHOP	FASTENER	BRUSH	STICKY	VISCOUS
Sorting Group 1						
TOOLS	Hoe Shovel Rake	Hammer Chisel Saw Drill		Brush Whisk		
STICKY FASTENER					Glue Cement Plaster	
TOOLS FASTENER		Nail	Clamp Wire			
OILY SUBSTANCE						Oily Grease
VISCOUS SUBSTANCE						Paint Varnish Wax Polish

Chi-squared = 55.61; significant at .001 level

Figure 6.5. Tools Terms - Comparison of Ratings Subjects With Sorting Group 1

TOOLS TERMS

Ratings Group						
	TOOLS				SUBSTANCE	
	GARDEN	SHOP	FASTENER	BRUSH	STICKY	VISCOUS
Sorting Group 2						
SHOP TOOLS		Chisel Drill Saw Nail Hammer	Wire Clamp			
GARDEN TOOLS	Hoe Rake Shovel					
BRUSH				Brush Whisk		
STICKY SUBSTANCE					Cement Plaster Glue	
OILY SUBSTANCE						Grease Oil
VISCOUS SUBSTANCE						Paint Polish Wax Varnish

Chi-squared = 83.95; significant at .001 level

Figure 6.6. Tools Terms - Comparison of Ratings Subjects With Sorting Group 2

TOOLS TERMS

	Ratings Group					
		TOOLS			SUBSTANCE	
	GARDEN	SHOP	FASTENER	BRUSH	STICKY	VISCOUS
Sorting Group 3						
SUBSTANCE					Glue Cement Plaster	Oil Grease Paint Wax Varnish Polish
BRUSH				Brush Whisk		
SHOP TOOLS		Hammer Chisel Drill Saw		Clamp		
GARDEN TOOLS	Hoe Shovel Rake					
FASTENER		Nail	Wire			

Chi-squared = 64.88; significant at .001 level

Figure 6.7. Tools Terms - Comparison of Ratings Subjects With Sorting Group 3

between *oil* and *drill* is quite frequent. That particular item illustrates that, unfortunately, it is impossible to keep extraneous information from influencing subjects' judgements of meaning similarity.

Furniture Similarity Ratings Study

Subjects. Twenty-two students from an introductory psychology course performed the task for course credit. Seven were later dropped because they used the 8 or 9 rating more than 50% of the time. This left nine males and six females, 17 to 22 years old.

Stimuli. Twenty-one furniture words were used as stimuli. The complete set is shown in Table 6.7 and Figures 6.8 and 6.9. Some of the terms were taken from the list used by Rosch (Rosch & Mervis, 1975) and the rest were chosen by the experimenter. It was assumed that all of the words would represent common furniture types. Many subjects, however, did not know *hassock*, or *ottoman*. Definitions for these words were provided upon request.

Results. The hierarchical clustering of subjects showed that there were no subject groups. The D and Mann-Whitney statistics calculated for two groups were non-significant.

The objects were analyzed using multidimensional scaling because one of the underlying components, *length*, represented a continuous variable. It was assumed that the multidimensional scaling solution would produce a more

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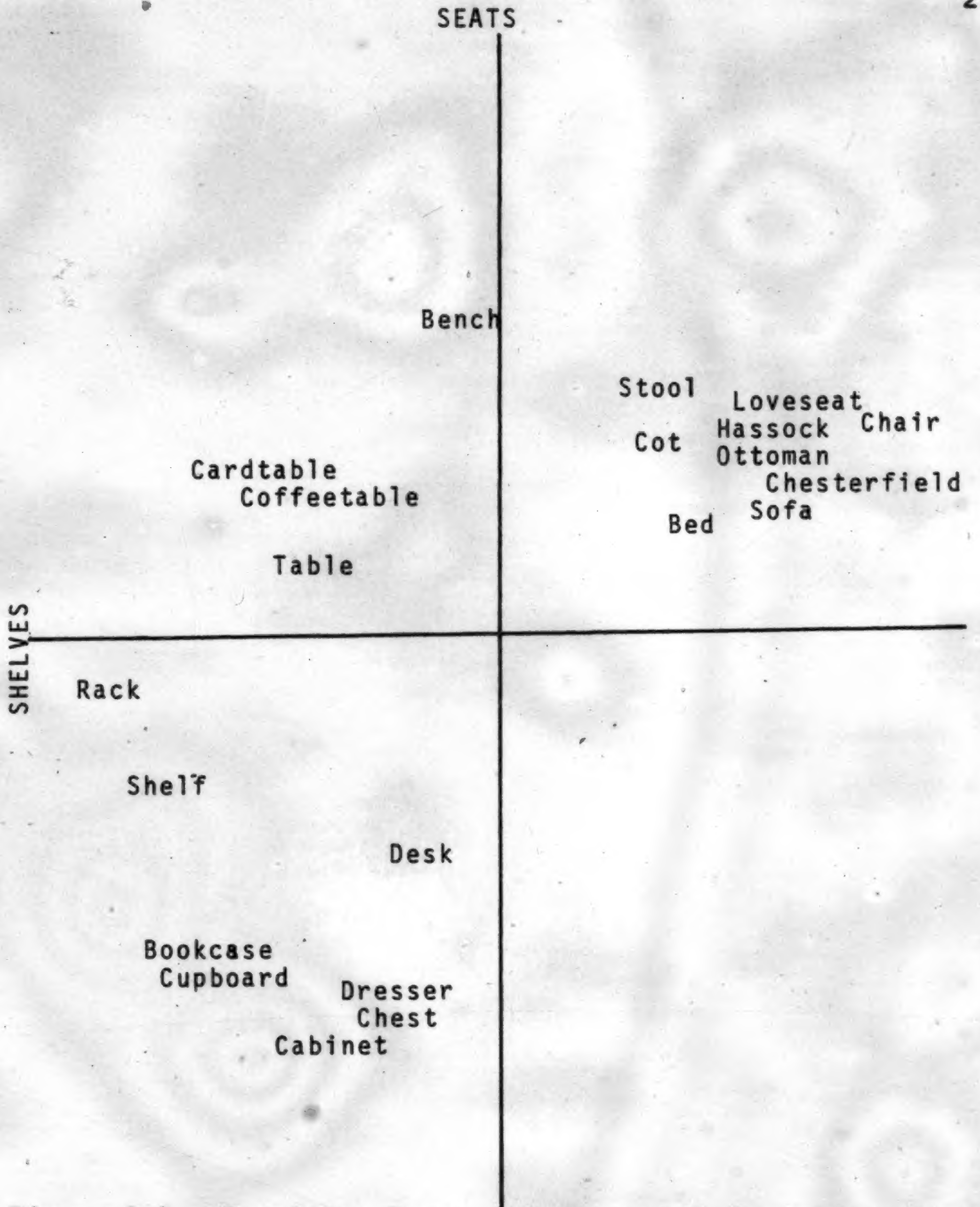

Figure 6.8. Furniture Terms - Seats and Shelves Dimensions

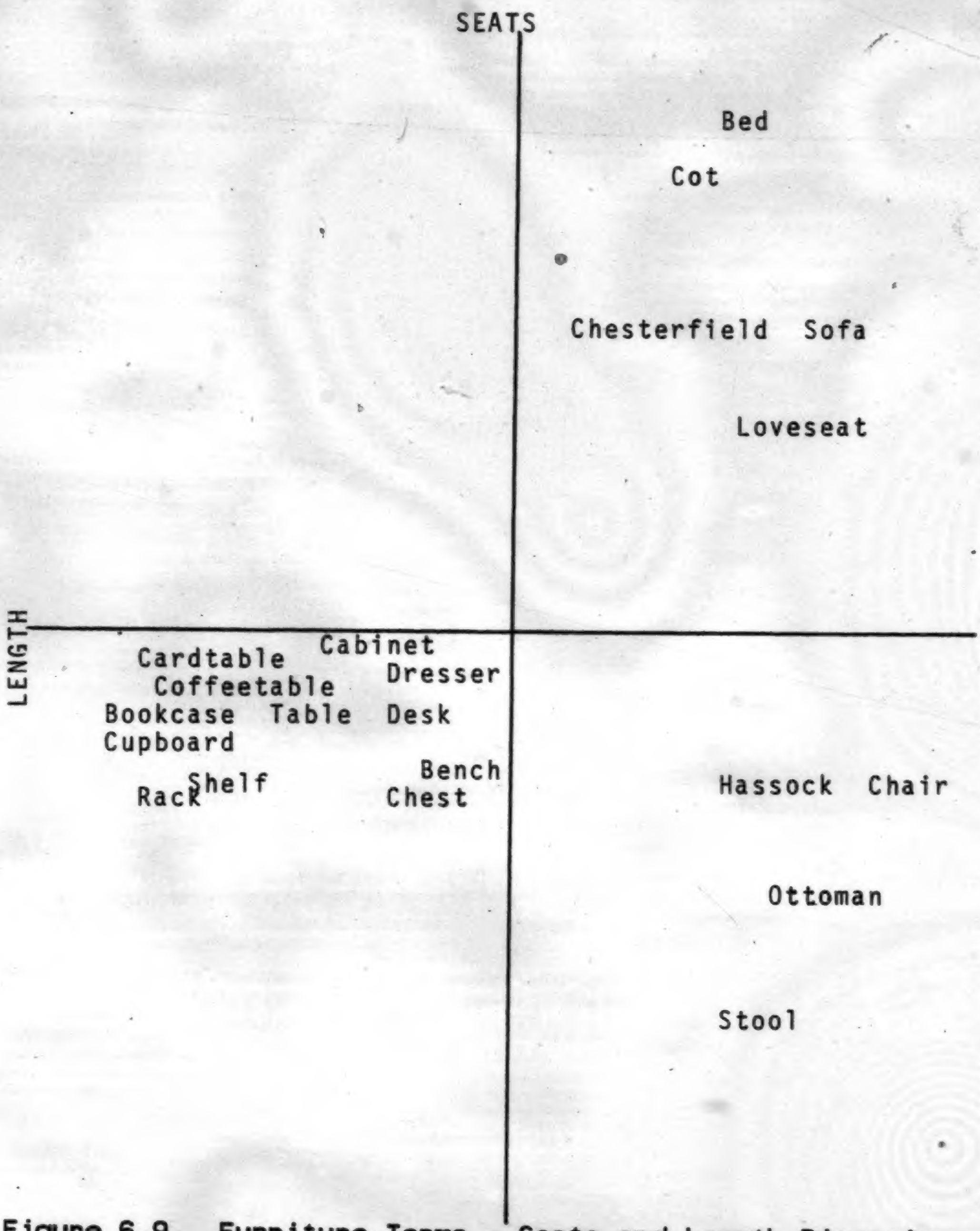

Figure 6.9. Furniture Terms - Seats and Length Dimensions

interpretable configuration of the results than the hierarchical clustering schema which indicates categories rather than dimensions.

Three dimensions resulted from the multidimensional scaling, these are shown in Figures 6.8 and 6.9. Dimension I represented things people sit on versus other kinds of furniture. Figure 6.8 shows that *bench* is almost neutral on this dimension. This word is ambiguous; it could be referring to a park bench or a workbench; the subjects appeared to be uncertain as to which interpretation was correct. Dimension III distinguishes between furniture one puts things on versus furniture one puts things into. The last dimension represents length of the objects. *Bed* is considered the longest piece of furniture and *stool* is the shortest.

Furniture Sorting Study

Subjects. Thirty-two males and twenty-one females, 17 to 34 years old, participated in this study. All subjects were enrolled in an introductory psychology course and received a course credit.

Stimuli. The same twenty-one furniture terms used in the ratings study were presented as stimuli.

TABLE 6.6

FURNITURE WORDS SUBJECT GROUPS

Sorting Subjects	D	M-W
Group 1 N=45	.450	23.557***
Group 2 N=8	.128	2.967**

* = .05 ** = .01 *** = .001 level of significance

Results. The hierarchical clustering solution showed that two subject groups occurred. The D and Mann-Whitney statistics for each group are given in Table 6.6.

Group 1 sorted the furniture by function: for sleeping on, for sitting on, to put things in, to put things on, and footstools. Group 1 clusters are presented in Table 6.7. There were 28 males and 17 females in Group 1.

Group 2 subjects sorted the furniture words according to the place where they occur: bedroom, den or family room, kitchen, dining room, and living room. These clusters are shown in Table 6.7. Group 2 had four females and four males.

TABLE 6.7

FURNITURE WORDS CLUSTERS - SORTING GROUPS

Clusters	D	M-W
Group 1		
Function		
Sleeping: Bed, Cot	.976	.....
Sitting: Bench, Chair, Stool, Sofa, Chesterfield, Loveseat	.653	6.235***
Put Things In: Bookcase, Rack, Shelf, Cabinet, Cupboard, Dresser, Chest	.705	7.305***
Table: Cardtable, Coffeetable, Table, Desk	.751	4.084***
Footstool: Hassock, Ottoman	.608	.....
Group 2		
Place		
Bedroom: Bed, Chest, Dresser, Cot	.799	4.449***
Den: Bench, Cardtable, Hassock, Desk, Bookcase	.233	3.516***
Kitchen: Cabinet, Shelf, Rack, Stool	.462	3.679***
Dining Room: Chair, Cupboard, Table	.581	2.787**
Living Room: Chesterfield, Loveseat, Sofa, Coffeetable, Ottoman	.780	5.305***

* = .05   ** = .01   *** = .001 level of significance

Comparison of Rating and Sorting Experiments

The contingency table in Figure 6.10 indicates that Sorting Group 1, who sorted the furniture terms by function, seems most similar to the Ratings subjects. The comparison between Ratings subjects' data and Sorting Group 2 shown in Figure 6.11, resulted in a non-significant Chi-squared. This seems quite reasonable since Sorting Group 2 subjects organized the terms according to place and not function.

Discussion of the Concrete Frame of Reference

Linguists and philosophers have always considered concrete/abstract an important distinction of meaning. The results reported in this section suggest that this distinction has some psychological validity. Subjects certainly responded differently in the experiments using concrete terms than with other types of words. The data indicated that the subjects using concrete frames were more variable in their responses than were subjects using the evaluative frame of refenence. At first, this result may appear to be the opposite of what should be expected. In categorizing concrete objects the subjects can refer to objects in the real world, and it might be supposed that there would be high agreement among the subjects as to what the relevant attributes are.

FURNITURE TERMS

	Ratings Group			
	BEDROOM	SITTING	TABLE	LIVING ROOM
Sorting Group 1				
SLEEPING	Bed Cot			
SITTING		Bench Chair Stool Sofa		Chesterfield Loveseat
STORAGE	Cupboard	Shelf	Bookcase	Rack Cabinet Dresser Chest
TABLES	Desk		Cardtable Coffeetable Table	
Footstool	Ottoman			Hassock

Chi-squared = 28.98; significant at .01 level

Figure 6.10. Furniture Terms - Comparison of Ratings Subjects With Sorting Group 1

FURNITURE TERMS

Sorting Group 2 \ Ratings Subjects	BEDROOM	SITTING	TABLE	LIVING ROOM
BEDROOM	Bed Cot			Chest Dresser
DEN	Desk	Bench	Cardtable Bookcase	Hassock
KITCHEN		Shelf Stool		Cabinet Rack
DININGROOM	Cupboard	Chair	Table	
LIVINGROOM	Ottoman	Sofa	Coffeetable	Chesterfield Loveseat

Chi-squared = 9.55; non-significant

Figure 6.11. Furniture Terms - Comparison of Ratings Subjects With Sorting Group 2

The meanings of evaluative terms, on the other hand, are mainly formulated from personal experiences. In this case it might be expected that subject responses should tend to be idiosyncratic rather than conventional.

This apparent contradiction may be resolved if one considers the manner in which the conventional aspects of concrete and abstract meanings are acquired. Evaluative terms actually have very few conventional meaning components associated with them, the positive-negative dimension being the most salient. This meaning component may become attached to an emotional experience long before the child learns the appropriate label. Consider the child in the midst of a temper tantrum; he most likely feels very angry. His behavior is not particularly socially acceptable, and his mother may respond by saying "Stop that!" or "Don't be naughty." From this exchange the child learns that his emotional experience is conventionally considered to be negative. This child will eventually learn that there are relatively few significant attributes of meaning which can be conventionally applied to his complex internal experiences.

The acquisition of concrete meaning may be somewhat different. Usually, a child is presented with an object and an accompanying lexical label. The relevant attributes are rarely specifically pointed out, however, since it is assumed that the child can apprehend them directly. For concrete words, the child has a wide variety of conventionally acceptable attributes available to him. He must rely on situational and linguistic context to decide which particular attributes are relevant at any given time. In the sorting and ratings tasks the subjects were not given enough contextual information to decide which attributes they ought to use for categorization purposes. Hence, the data reveal more subject variation than for the studies of evaluative terms.

Rosch (Rosch et al., 1976) provided her subjects with contextual information by instructing them how to respond, and she found good agreement among her subjects as to the appropriate attributes for the concrete words she used as stimuli. For example, one group was asked to provide attributes, while another responded with the motor interactions people have with objects. In isolation, with no instructions about how to respond, people can find many aspects of objects salient. Subjects in the similarity ratings studies commented that they would have found the task easier if they had been directed to respond on some particular basis such as function or form. It is possible then, that contextual information is more important for interpreting concrete than evaluative words, since language users have a wider variety of conventional interpretations open to them.

Social Frame of Reference

The social frame of reference shares characteristics of both the evaluative and concrete frames. On the one hand, social words are judged using one's personal point of view, like the evaluative frame, while on the other, the social frame develops from experiences with the external environment as with the concrete frame.

Deixis is an important concept for understanding the social frame of reference. Lexical sets which are interpreted with this frame help the language user orient himself in the world and in his society (Weinreich, 1966b; Fillmore, 1966; 1975b; Lyons, 1968). Prepositions, for example, provide information about the temporal and spatial relation of a person, object, or event, to other persons, objects, or events, while personal pronouns relate the participants in a conversational exchange. The acquisition of social lexical items is probably an important part of the process of decentration. Not only does the child learn to distinguish between himself and others, but he also learns his place in the world with respect to others.

Kinship terms and personal pronouns are probably the most important social lexical items, since words in these lexical fields indicate the social relationships among individuals. These two lexical fields were investigated in the present study. The results indicate that both sets were judged using the self as a reference point for determining the meanings of words in the stimulus set.

Pronouns

Pronouns are among our most important indexical lexical sets. Their use is tied to the here and now of a discourse since the referent of a pronoun can quickly shift. "I" becomes "you" as soon as the speaker passes his role to the hearer.

Not all languages have the same organization for their set of pronouns, for example, inclusive and exclusive first person plural forms can occur. All languages, however, appear to distinguish first person from the others. Lyons (1968, p. 276) has suggested that the primary distinction in a pronoun system may be between first and non-first (second and third) persons. Lyons points out that the speaker normally takes an egocentric view of a conversation so that the first person role would naturally be the most important. In English, the first person pronoun is also the only one which is capitalized, indicating the importance of this pronoun to speakers.

Fillenbaum and Rapoport (1971) found experimental evidence in support of Lyon's hypothesis. Two dimensions resulted from the multidimensional scaling of their proximity data; first versus non-first person pronouns, and singular versus plural. The pronouns fell into clusters: third person plural, second person, third person masculine singular, third person feminine singular, first person plural, and first person singular. These results conform to the standard linguistic analysis of the English pronoun paradigm.

One of the aims of the present study was to observe how subjects would judge person deixis in a semantic task. Only the semantic similarity ratings task was performed with the pronouns so there is no sorting study reported below; instead, both the multidimensional scaling and hierarchical clustering solutions for the similarity ratings data are presented. These results can be viewed as an illustration of how the two types of analyses can reveal different aspects of the same data set.

Pronouns Similarity Ratings Study

Subjects. Twenty-seven females and twenty-two males in an introductory psychology course participated for course

TABLE 6.8

PRONOUNS CLUSTERS - RATINGS STUDY

Clusters	D	M-W
First Person		
Singlular: I, Me, My	.654	2.883**
Plural: We, Us, Our	.586	2.883**
Second Person		
You, Your	.588	.....
Third Person		
Masculine: He, Him, His	.629	2.884
Feminine: She, Her	.629	.....
Neuter: It, Its, One	.404	2.362*
Plural: They, Them, Their	.575	2.883**

* = .05 ** = .01 *** = .001 level of significance

credit. They were 17 to 25 years old. It was only necessary to drop two subjects from the original subject pool for using 8 or 9 more than 50% of the time.

Stimuli. The standard English pronoun paradigm was used for the stimuli. The set is the same as the one used by Fillenbaum and Rapoport (1971) except that *one, it* and *its* were added. These pronouns are common in English and it is not clear why Fillenbaum and Rapoport did not include them.

Results. The heirarchical clustering solution showed that no subject groups were present in the data. The D and Mann-Whitney statistics which were calculated for two groups, support this conclusion.

The multidimensional scaling analysis of the similarity ratings revealed four dimensions. Dimension I (Figure 6.12) distinguished between first person and all other persons as Lyons (1968) suggested. *One* is neutral on this dimension indicating that subjects were not sure whether this was a first or third person pronoun. It can be used in either sense, although the first person usage is more common in British than Canadian English.[2] Dimension II (Figure 6.12) separated singular from plural terms. Figure 6.13 shows Dimension III which distinguishes human from non-human (neuter) pronouns. Dimension IV as shown in Figure 6.14 revealed the male-female component.

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[2] An excellent example of the first person usage comes from an interview with author V.S. Naipaul. He was describing a nervous breakdown he had while studying in England: "One was terrified of human beings. One didn't wish to show oneself to them. I did see a doctor about it." (*Newsweek*, November 16, 1981)

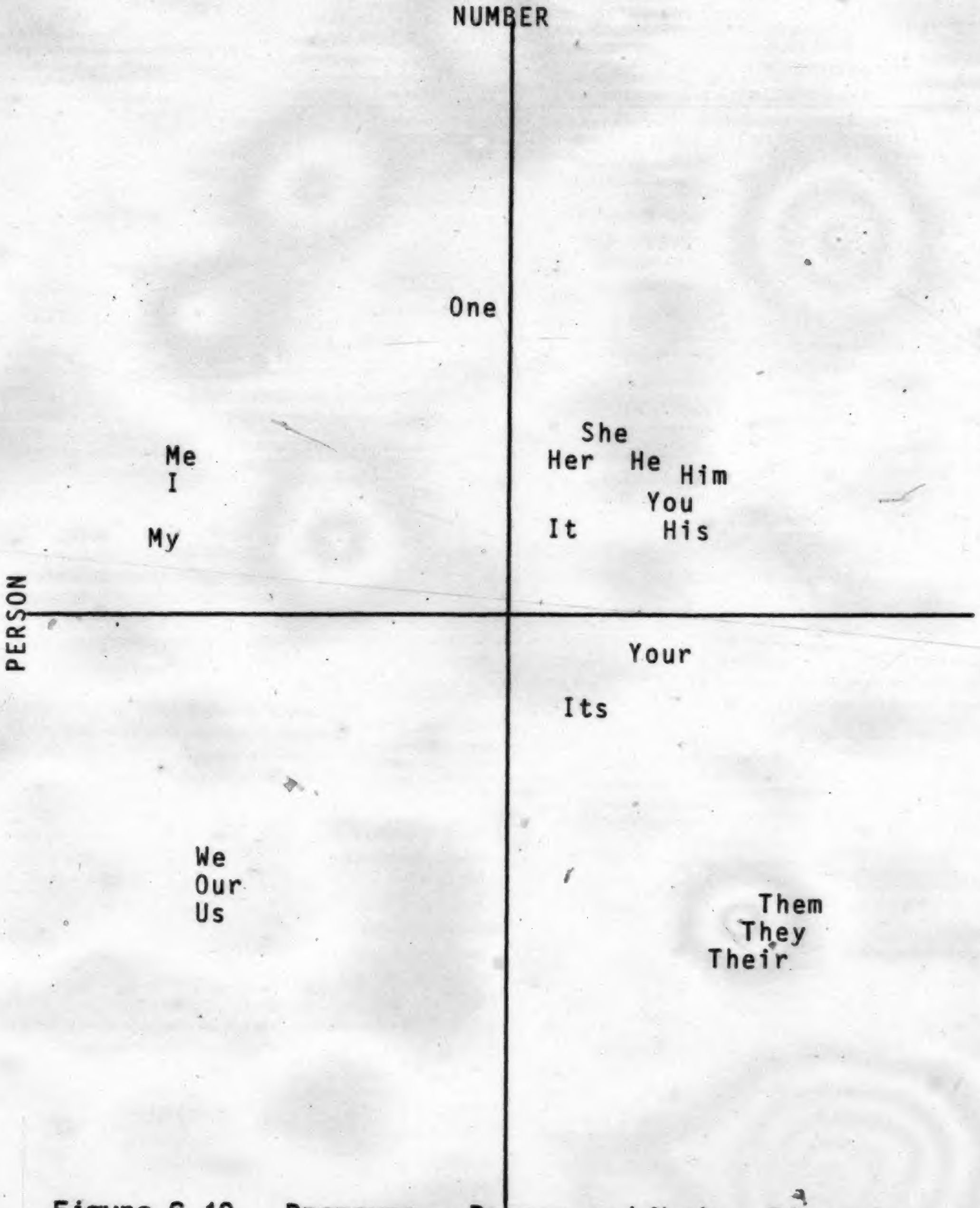

Figure 6.12. Pronouns - Person and Number Dimensions

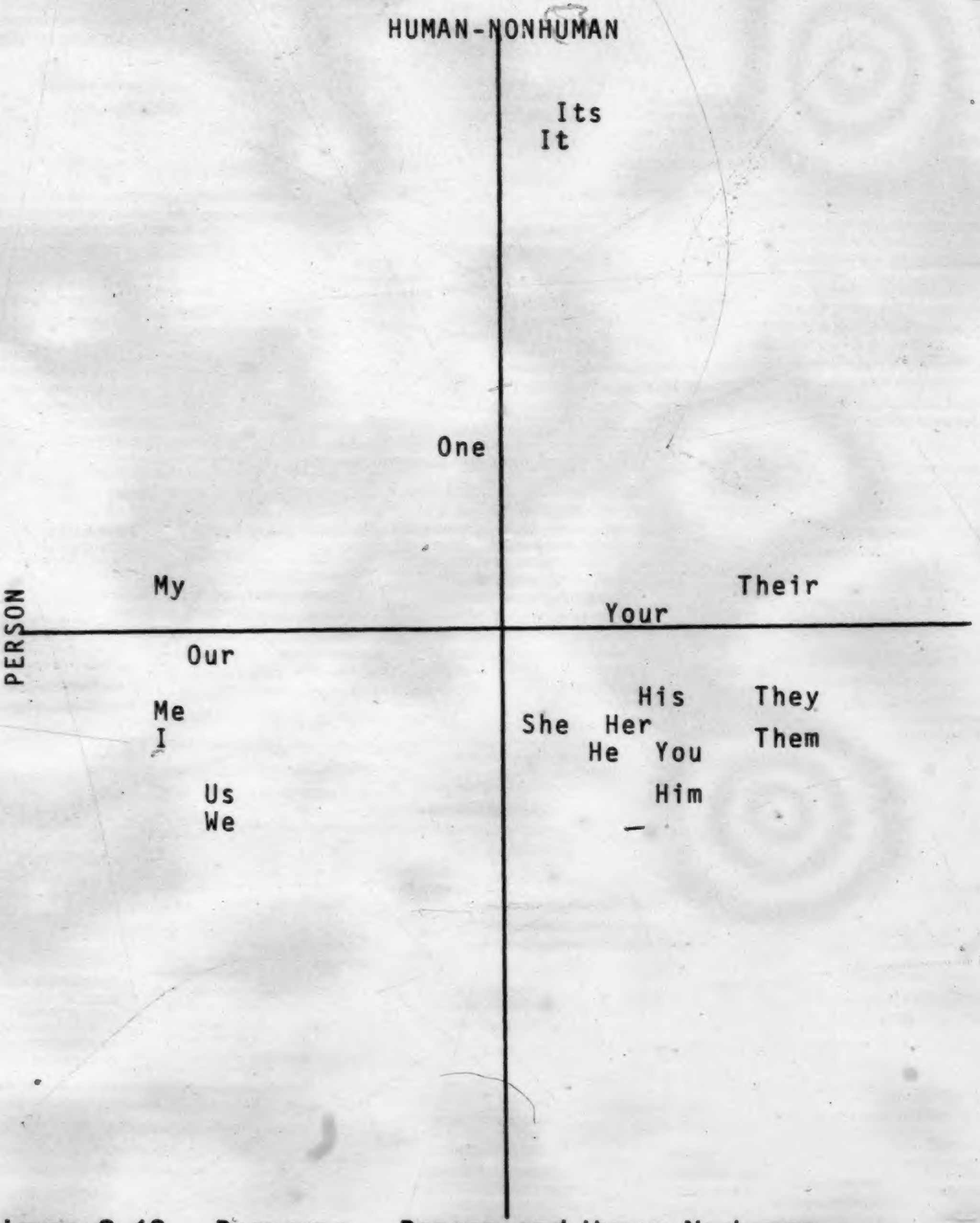

Figure 6.13. Pronouns - Person and Human-Nonhuman Dimensions

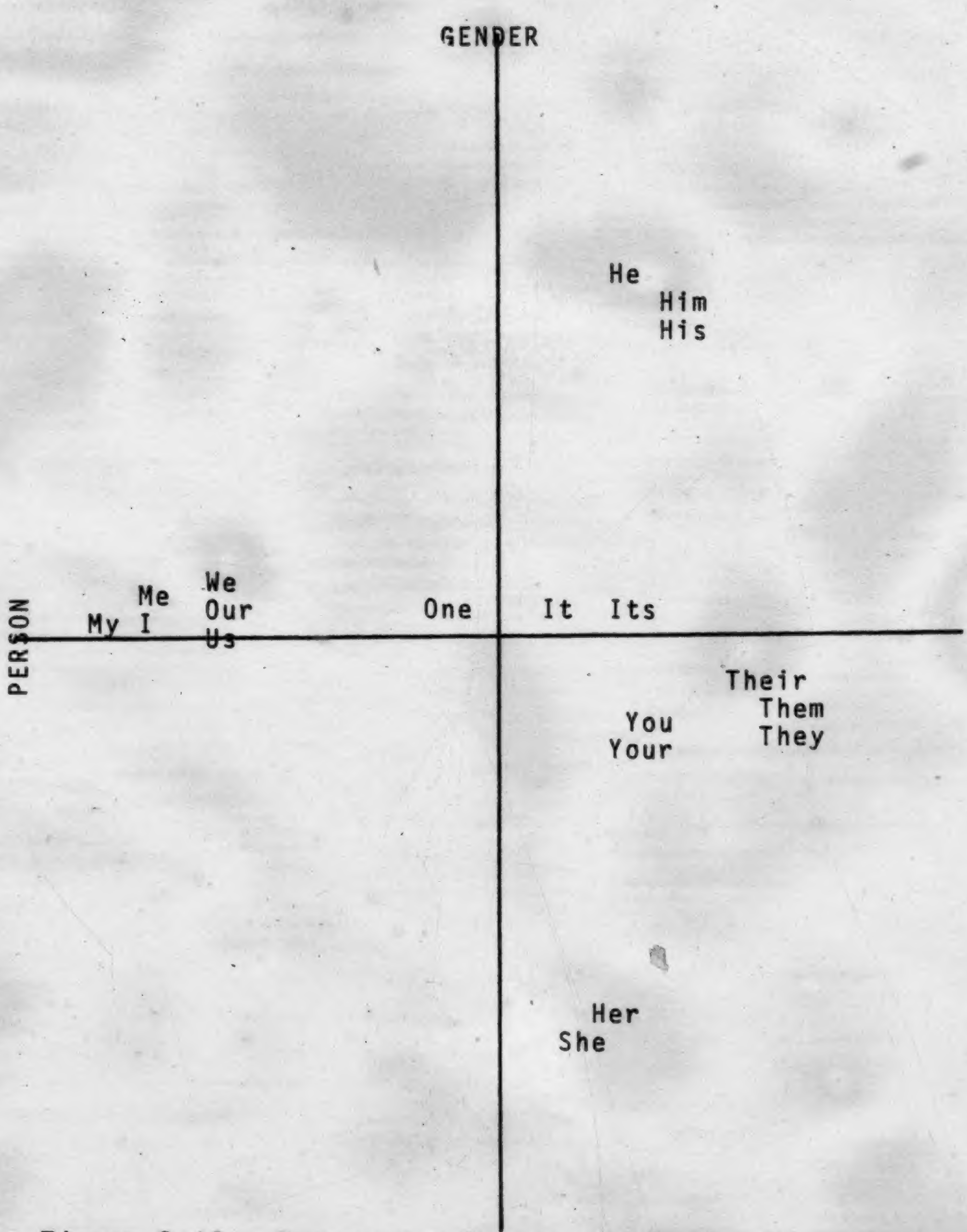

Figure 6.14. Pronouns - Person and Gender Dimensions

The pronoun similarity ratings were also analyzed using hierarchical clustering. Table 6.8 shows six coherent clusters: first person singular, second person, third person masculine singular, third person feminine singular, third person neuter singular, and third person plural. This analysis agrees with the hierarchical clustering schema from Fillenbaum and Rapoport (1971) and follows traditional formal linguistic views of the pronoun paradigm.

Both analyses of pronouns produced the same meaning components, supporting the view expressed earlier that either analysis can reveal the salient semantic components of a lexical set. The multidimensional scaling analysis has the advantage of showing somewhat more clearly the importance of first person for language users.

Kinship Terms

The set of kinship terms is one of the most frequently studied semantic domains, cross-culturally and also for semantic investigations of English. One reason is because the relevant semantic components appear to be easily determined. Usually, the semantic components of kinship terms are based on biological relationships among individuals and affinal ties such as marriage.

The usual approach in a componential analysis of kinship terms is to find the components which will uniquely distinguish each kinship term from all others in a language. Wallace and Atkins (1960) determined that three dimensions would be sufficient for contrasting all the English kinship terms. The three dimensions are: sex of relative, generation (two generations above or below ego, one generation above or below ego, and ego's generation), and lineality (lineal, colineal, and ablineal). The last dimension requires some explanation; a lineal relative has exactly the same ancestors and descendants as ego, colineal relatives have the same ancestors as ego but different descendants, and ablineal kinsmen are consanguinal relatives who are neither lineal nor colineal. The complete system described by Wallace and Atkins (1960) is shown in Figure 6.15.

In an attempt to provide an analysis of kinship terms with a possible cognitive foundation, Romeny and D'Andrade (1964) proposed a different set of basic semantic components. A system of distinctive features was suggested rather than the continuous dimensions Wallace and Atkins had used. Not all of the features are relevant to the English kinship system; the ones which are follow: sex of relative, relative age, and reciprocity.

	Lineal		Colineal		Ablineal
	male	female	male	female	
1	Grandfather	Grandmother	Uncle	Aunt	
2	Father	Mother			
3	Ego		Brother	Sister	Cousin
4	Son	Daughter	Nephew	Niece	
5	Grandson	Granddaughter			

Wallace and Atkins' (1960) kinship system

	Direct		Collateral	
	male	female	male	female
+2	Grandfather	Grandmother		
-2	Grandson	Granddaughter		
+1	Father	Mother	Uncle	Aunt
-1	Son	Daughter	Nephew	Niece
0	Brother	Sister	Cousin	

Romney and D'Andrade's (1964) kinship system

Figure 6.15. Two Systems for English Kinship Terms Derived Using Componetial Analysis

The reciprocal feature is designed to eliminate the five degrees of generation proposed by Wallace and Atkins. For example, the difference between *grandfather* and *grandson* is not three generations, but rather opposite values of the same feature; *grandfather* is +senior, while *grandson* is -senior. It is assumed that *grandfather* and *grandson* have exactly the same set of meaning features except for opposing values on reciprocity. The reciprocity feature can only be interpreted for any given pair of words rather than for an individual term without reference to its reciprocal.

Another distinctive feature used by Romney and D'Andrade, although not listed in their basic set, is collateral-direct. Direct relatives have exactly the same ancestors as ego, while collateral relatives do not. Figure 6.15 represents Romney and D'Andrade's analysis of kinship terms in contrast to Wallace and Atkins' model. Figure 6.15 shows that Romney and D'Andrade's model is not strictly binary, as they claim, since there are three levels of generation.

The set of kinship terms has been used as stimuli in several psycholinguistic experiments in an attempt to determine which of the componential analyses is psychologically real (Fillenbaum & Rapoport, 1971; Romeny & D'Andrade, 1964; Wexler & Romney, 1972). The various studies indicate that

Romney and D'Andrade's reciprocity feature is more in accord with the subject's responses than Wallace and Atkins' five levels of generation; or to put it more simply, subjects found *grandfather/grandmother* more similar to *grandson/grandaughter* than Wallace and Atkins' analysis would have suggested. Other findings were that the sex distinction evenly divides the set of terms (except of course, for *cousin*) and the two sexes have a parallel structure. This effect was so strong that Wexler and Romney (1972) felt confident in analyzing only the male half of the kinship set.

The evidence is less clear, however, as to which description of lineality is cognitively salient. Fillenbaum and Rapoport (1971) reported that their results appear to support Wallace and Atkins' three value dimension. Wexler and Romney (1972) noted that both Wallace and Atkins' and Romeny and D'Andrade's models overpredicted subject responses to the pairs *father-uncle*, *son-nephew*, and *brother-cousin* which all differ on lineality only. Both models predict that the above listed pairs would be seen as closer in meaning than they actually were by the subjects participating in the experiment. Wexler and Romney conclude that the various dimensions underlying kinship terms may not all have the same salience for everyone in the subject pool, with collateral-direct being one of the less salient dimensions. The experimental results reported below indicate that this may indeed be the case.

Kinship Terms Similarity Ratings Study

Subjects. Ninety-one native speakers of English participated in this experiment. They were students in an introductory psychology course and received course credit. Four subjects were dropped because they provided a rating of 9 for more than 50% of the stimulus pairs. This left 61 males and 26 females, 17 to 28 years old.

Stimuli. The fifteen kinship terms used by Fillenbaum and Rapoport (1971) and others (Romney & D'Andrade, 1964; Wallace & Atkins, 1960) were the stimuli. They are listed in Figures 6.16 to 6.18.

Results. Individual Differences Scaling Analysis was performed on the subjects' data. The four dimensions which resulted are shown in Figures 6.16 to 6.18. Dimension I shows the male-female distinction. The set of terms is evenly split except for *cousin* which is neutral on this dimension as would be expected.

TABLE 6.9
KINSHIP TERMS SUBJECT GROUPS

Ratings Subjects	D	M-W
Group 1 N=28	.167	15.165***
Group 2 N=45	.446	13.256***
Group 3 N=14	.179	10.028***
Sorting Subjects		
Group 1 N=31	.454	17.312***
Group 2 N=7	.610	5.511***
Group 3 N=14	.575	9.466***
Group 4 N=6	.570	6.591***

* = .05 ** = .01 *** = .001 level of significance

Dimension II indicates lineality. The basic distinction appears to be collateral versus direct as predicted by Romney and D'Andrade (1964). *Brother/sister*, however, tend more toward the *uncle/aunt*, *nephew/niece* side as Wallace and Atkins have suggested. The weights of *brother/sister* on

Dimension II are low, .01 and .09 respectively, so that these terms might be considered neutral with respect to lineality; the subjects being unable to decide whether *brother/sister* are in a direct line with ego or not.

Dimension III distinguishes nuclear from extended family. Dimension IV indicates at least four degrees of generation close to what Wallace and Atkins have predicted. *Brother*, *son*, *nephew*, *cousin*, *sister*, *daughter*, and *niece* are all at approximately the same generation level. At first it might appear that *son/daughter* are misplaced at the same level as *brother/sister*, rather than one generation below a presumed ego. This result contradicts what is predicted by the *a priori* analyses. It should be remembered, however, that all of the subjects are quite young; few would be likely to have had experience in parental roles and none would have been grandparents. Therefore, most subjects would think of themselves as sons or daughters and brothers or sisters simultaneously. This would have the effect of placing *son/daughter* at the same generation as ego rather than one generation below as Wallace and Atkins predicted.

There is some evidence that subjects have the notion of reciprocity described by Romney and D'Andrade (1964).

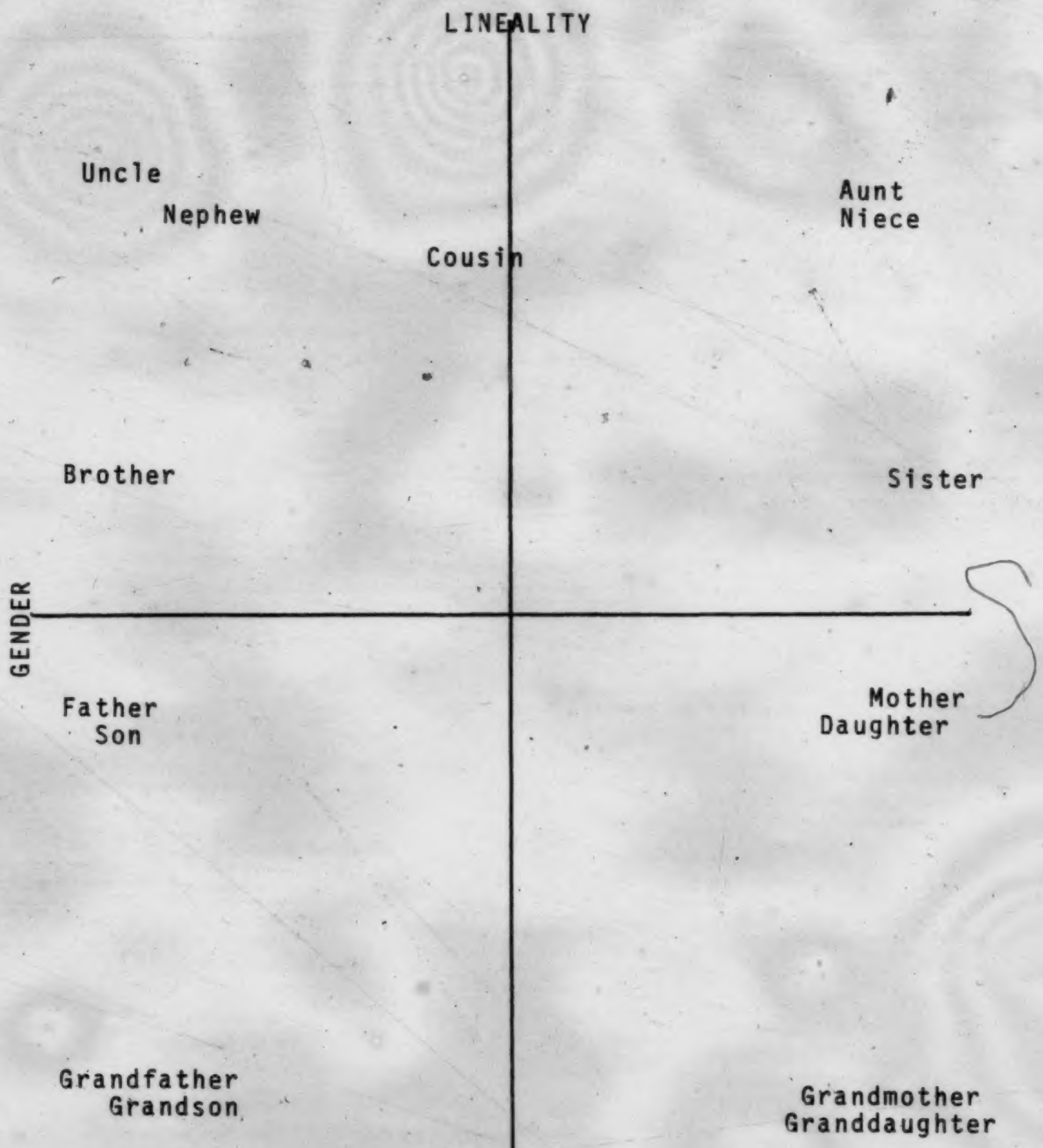
LINEALITY
GENDER
Uncle
Nephew
Cousin
Aunt
Niece
Brother
Sister
Father
Son
Mother
Daughter
Grandfather
Grandson
Grandmother
Granddaughter

Figure 6.16. Kinship Terms - Gender and Lineality Dimensions

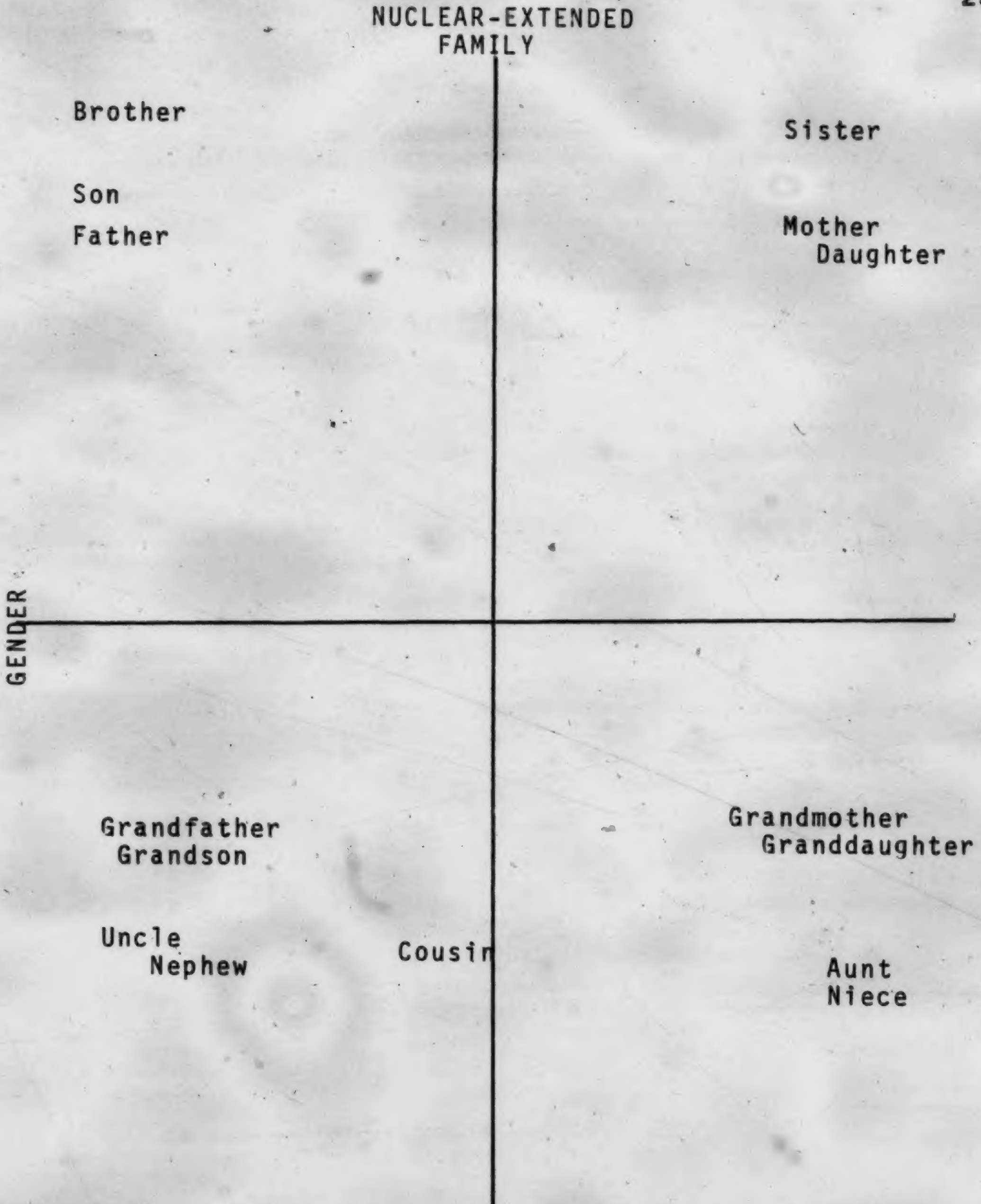

Figure 6.17. Kinship Terms - Gender and Nuclear-Extended Family Dimensions

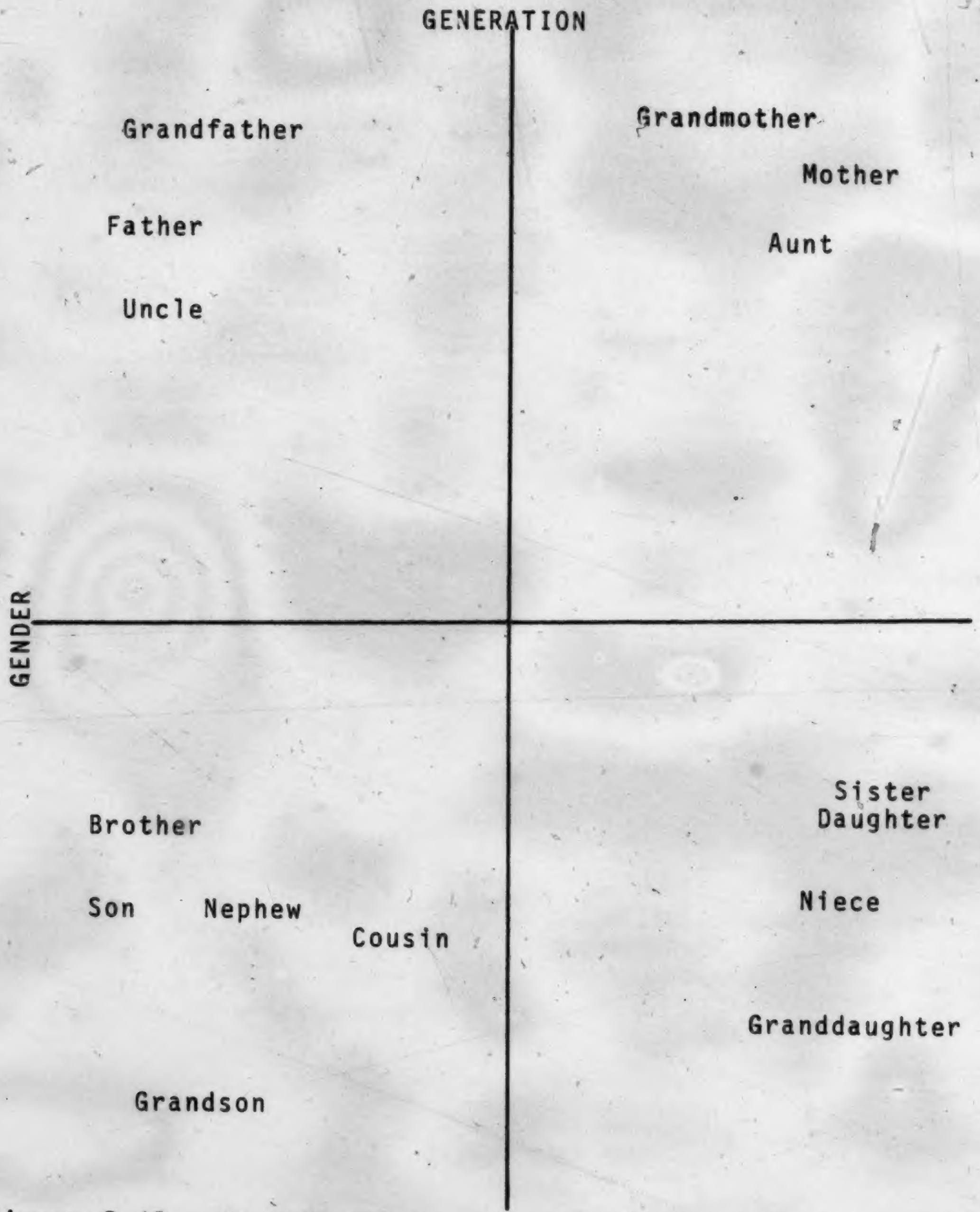
GENERATION
GENDER
Grandfather
Father
Uncle
Grandmother
Mother
Aunt
Brother
Son
Nephew
Cousin
Sister
Daughter
Niece
Granddaughter
Grandson

Figure 6.18. Kinship Terms - Gender and Generation Dimensions

Except for Dimension IV, all of the reciprocal pairs grouped together as would be expected from the Romney and D'Andrade model. There is no corresponding INDSCAL dimension, however, since reciprocity is a binary feature and therefore is inappropriate for being represented in a dimensional solution. This feature is only relevant to pairs of words, something not easily shown along a dimension.

A hierarchical clustering of the subjects' responses indicated three subject groups, Table 6.9 presents the Distinctiveness and Mann-Whitney statistics for each group. It might be expected that the groups correspond to sex differences. This does not appear to be the case; Group 1 has 21 males and 7 females, Group 2 consisted of 15 females and 30 males, and Group 3 had 4 females and 10 males. The possibility of sex-related differences cannot be entirely ruled out, however, since this study had an unequal number of male and female subjects. Further investigation of this variable is necessary, but on the basis of the present data it seems unlikely that sex differences would be significant. Age could not have been a factor distinguishing among the groups because the subjects were all about the same age. It seems, then, that some as yet unidentified factor contributed to differential salience of the dimensions for the subjects.

Table 6.10 shows the clustering of terms for Group 1. These subjects found sex and lineality the most salient meaning components. For Group 2 subjects the nuclear-extended family and lineality dimensions were most important. Only the sex dimension was dominant for Group 3.

The interpretation of subject groups was supported by the weights for each subject on each INDSCAL dimension. The weights of salience are calculated independently for each subject by the INDSCAL program, so rather than comparing them directly, the ranking of the four dimensions by the subjects was considered. The mean ranks for each dimension for each subject group are presented in Table 6.11.

Chi-squared was calculated to determine whether group membership was independent of rank on a given dimension. Chi-squared = 49.138, which is significant beyond the .001 level, indicating that group membership is not independent of rank ordering of the dimensions. Table 6.11 shows that Groups 1 and 3 rank ordered the four dimensions in approximatley the same way, except that all Group 3 members considered sex differences the most important criterion for distinguishing among kinship terms. Group 2 clearly found Dimension II, lineality, the most important dimension. Dimension IV, generation, was almost negligible for these

TABLE 6.10

KINSHIP TERMS CLUSTERS - RATINGS GROUPS

Clusters	D	M-W
Group 1		
Nuclear Family		
Female: Mother, Grandmother	.562	.....
Daughter, Granddaughter	.490	.....
Male: Father, Grandfather	.556	.....
Son, Grandson	.491	.....
Collateral: Brother, Sister	.527	.....
Extended Family		
Uncle, Aunt, Nephew, Niece, Cousin	.345	4.176***
Group 2		
Nuclear Family		
Direct: Mother, Father, Son, Daughter, Brother, Sister	.341	5.325***
Collateral: Grandfather, Grandmother, Grandson, Granddaughter	.502	3.941***
Extended Family		
Uncle, Aunt, Nephew, Niece, Cousin	.401	4.960***
Group 3		
Sex		
Female: Mother, Grandmother, Aunt, Sister, Daughter, Niece, Granddaughter	.456	6.537***
Male: Father, Grandfather, Uncle, Son, Brother, Grandson,	.439	5.462***
Unmarked: Nephew, Cousin	.512	.....

* = .05 ** = .01 *** = .001 level of significance

TABLE 6.11

MEAN RANK ORDERING OF WEIGHTS FROM THE INDSCAL DIMENSIONS FOR EACH RATINGS SUBJECT GROUP

	SEX	LINEALITY	NUCLEAR-EXTENDED FAMILY	GENERATION
Group 1	1.69	2.19	3.04	3.08
Group 2	2.72	1.56	2.08	3.64
Group 3	1.00	2.86	3.43	2.71

subjects.

Group 2 seems to be more in agreement with the Romney and D'Andrade model than Group 1 or 3. In particular, Group 2 did not organize the kinship terms along a five level generation dimension.

Kinship Terms Sorting Study

Subjects. Fifty-eight students from an introductory psychology course particpated for course credit. There were 24 females and 34 males, 17 to 36 years old.

Stimuli. The same 15 kinship terms used in the ratings experiment were the stimuli in this study.

Results. The hierarchical clustering solution indicated that four subject groups were present in the data. Table 6.9 shows the cluster statistics for each group. The Distinctiveness and Mann-Whitney scores indicate that the groups are distinct from one another.

Table 6.12 shows five significant clusters for Group 1 subjects. The major distinction is between nuclear and extended family. The lower level clusters incorporate some notion of lineality. In the nuclear family group *brother/ sister* form a separate cluster. The grandparent and grandchildren terms are separated from the collateral items of the extended family clusters.

Group 2 subjects appear to have used generation as a criterion for sorting kinship terms. Table 6.12 shows five clusters, one for each of the five generations described by Wallace and Atkins (1960).

Group 3 clustering is presented in Table 6.12. These subjects also appear to have used the nuclear-extended family component as a basis for sorting the terms. Unlike Group 1, however, there is no indication of lineality in the nuclear family cluster.

TABLE 6.12

KINSHIP TERMS CLUSTERS - SORTING GROUPS

Clusters	D	M-W
Group 1		
Nuclear Family		
Direct: Mother, Father, Son, Daughter	.640	4.346***
Collateral: Brother, Sister	1.00	.....
Extended Family		
Collateral: Uncle, Aunt, Cousin	.670	3.004**
Nephew, Niece	1.00	.....
Direct: Grandfather, Grandmother, Grandson, Granddaughter	.711	4.114***
Group 2		
Generation		
+2: Grandfather, Grandmother	1.00	2.026***
+1: Mother, Father, Aunt, Uncle	1.00	5.000***
Ego's: Brother, Sister, Cousin	1.00	3.175***
-1: Son, Daughter, Nephew, Niece	.895	4.222***
-2: Grandson, Granddaughter	1.00	.....
Group 3		
Nuclear Family		
Mother, Father, Son, Daughter, Brother, Sister	1.00	6.127***

Extended Family		
Collateral: Uncle, Aunt, Cousin, Nephew, Niece	.838	5.383***
Direct: Grandfather, Grandmother, Grandson, Granddaughter	.949	4.171***
Group 4		
Sex		
Female: Mother, Daughter, Sister, Grandmother, Granddaughter, Aunt, Niece	.730	8.585***
Male: Father, Son, Brother, Uncle, Nephew Grandfather, Grandson	.729	8.320***
Unmarked: Cousin	1.00	.....

* = .05   ** = .01   *** = .001   level of significance

Group 4 subjects made a major distinction between male and female relatives. Table 6.12 shows the clusters for this subject group. *Cousin* is in a cluster by itself since it is neutral with respect to gender.

As in the ratings study sex did not appear to be a factor in determining group membership. Group 1 had 12 females and 19 males, Group 2 consisted of six males and one female, Group 3 had an equal number of males and females, and Group 4 was made up of four females and two males.

During the sorting task subjects were encouraged to write down the bases on which they were sorting. Their comments support the interpretation of clusters for each of the groups. Only one subject from Group 1 responded although a majority of subjects in the other groups volunteered comments. The results indicate that Group 1 subjects may have been less able to articulate on what basis they were sorting because they were using several different criteria. Subjects from the other groups were very definite in their responses which suggests that a consistent sorting criterion was used in each case.

The one subject from Group 1 who responded said that his clusters represented: "parent's immediate family", that is grandparents and grandchildren; "my family (I'm from)", parents and siblings; and "family related to my grandparents and to me."

Three out of seven Group 2 subjects volunteered that they were sorting by generation. Group 3 subjects said they were sorting into "close vs. secondary relatives", or "immediate vs. extended family." Group 4 subjects mentioned that they were sorting by sex. In addition, some of the Group 4 people stated that they were also sorting by immediate versus extended family. This is reflected in the clusters of Table 6.12 , but seems to be of borderline significance for the entire group.

Comparison of Rating and Sorting Experiments

A Chi-squared test of independence was performed for each of the three ratings groups compared with each of the four sorting subject groups. Contingency tables are only presented for those comparisons which resulted in a significant Chi-squared. The significant Chi-squares were supported by strong Spearman rank order correlation coefficients.

The contingency table in Figure 6.19 indicates that Ratings Group 1 came closest to matching Sorting Group 1. The Chi-squared test of independence between these two subject groups was significant at the .05 level. Each of these subject groups appeared to be making use of several of the underlying meaning components, particularly lineality and nuclear-extended family. The major difference between them is that Ratings Group 1 also considered gender an important criterion for distinguishing among kinship terms and the Sorting Group 1 subjects did not.

The Ratings Group 2 subjects also rated according to the nuclear-extended family meaning component and, therefore, correspond to both Sorting Group 1 and Sorting Group 3 who also used this distinction. The contingency tables for these two groups are in Figures 6.20 and 6.21. The Spearman rank order correlation coefficient supports the Chi-squared statistics. Ratings Group 2 correlates strongly with both Sorting Group 3, rho = .72, and Sorting Group 1, rho = .59.

Subjects in Ratings Group 3 were predominantly influenced by the gender meaning component in making their similarity judgements. As might be expected they correspond to Sorting Group 4. Figure 6.22 shows that the hierarchical clustering solutions resulted in almost identical clusters for the two subject groups. The correlation between Ratings Group 3 and Sorting Group 4 is also high, rho = .78.

Sorting Group 2 subjects, who sorted according to generation, did not appear to correspond to any of the ratings subject groups. It has already been noted that the generation meaning component was not particularly salient for any of the ratings subject groups, so this result is not surprising.

Subjects using either the sorting method or the semantic similarity ratings technique appear to be applying the same strategies for organizing the kinship terms. Each of the four sorting subject strategies approximately matched one of the four INDSCAL dimensions. The meaning components revealed by these two studies are also in agreement with previous *a priori* analyses and experimental results. One exception was the salience of the nuclear-extended family dimension. The subjects in the experiments reported in this chapter were first and second year university students and therefore, still attached to their parents and siblings. It would be interesting to test different age groups to determine what effect life experience with various roles has on the interpretation of kinship relations. It is possible that older people would provide a different organization for the kinship terms.

The results from the sorting and ratings studies show that although subjects may be aware of all the underlying meaning components for a lexical set, different subsets of subjects may find some meaning elements more salient than others. This is an important result because previous analyses have assumed, at least implicitly, that there should be no subject differences in lexical semantic experiments.

Discussion of Social Frame of Reference

One important aspect of the social frame of reference is that the ego is used as a point of orientation. Results

KINSHIP TERMS

Ratings Group 1						
	NUCLEAR FAMILY OLD FEMALE	YOUNG FEMALE	OLD MALE	YOUNG MALE	C'LATERAL	EXTENDED FAMILY
Sorting Group 1						
NUCLEAR DIRECT	Mother	Daughter	Father	Son		
NUCLEAR C'LATERAL					Brother Sister	
EXTENDED C'LATERAL						Uncle Aunt Cousin Nephew Niece
EXTENDED DIRECT	Grand-Mother	Grand-Daughter	Grand-Father	Grand-Son		

Chi-squared = 30; significant at .001 level

Figure 6.19. Kinship Terms - Comparison of Ratings Group 1 With Sorting Group 1

KINSHIP TERMS

	Ratings Group 2		
	NUCLEAR FAMILY		EXTENDED FAMILY
	DIRECT	COLLATERAL	
Sorting Group 1			
NUCLEAR DIRECT	Mother Father Son Daughter		
NUCLEAR COLLATERAL	Brother		
EXTENDED COLLATERAL			Uncle Aunt Cousin Nephew Niece
EXTENDED DIRECT		Grandfather Grandmother Grandson Granddaughter	

Chi-squared = 30; significant at .001 level

Figure 6.20. Kinship Terms - Comparison of Ratings Group 2 With Sorting Group 1

KINSHIP TERMS

Ratings Group 2	NUCLEAR FAMILY		EXTENDED FAMILY
	DIRECT	COLLATERAL	
Sorting Group 3			
NUCLEAR FAMILY	Mother Father Son Daughter Brother Sister		
EXTENDED COLLATERAL			Uncle Aunt Cousin Nephew Niece
EXTENDED DIRECT		Grandfather Grandmother Grandson Granddaughter	

Chi-squared = 30; significant at .001 level

Figure 6.21. Kinship Terms - Comparison of Ratings Group 2 With Sorting Group 3

KINSHIP TERMS

	Ratings Group 3		
	FEMALE	MALE	UNMARKED
Sorting Group 4			
FEMALE	Mother Daughter Sister Grandmother Granddaughter Aunt Niece		
MALE		Father Son Brother Uncle Grandfather Grandson	Nephew
UNMARKED			Cousin

Chi-squared = 21.42; significant at .001 level

Figure 6.22. Kinship Terms - Comparison of Ratings Group 3 With Sorting Group 4

from the pronoun study clearly show the importance of ego; the first person pronouns are distinguished from all other persons; and subjects performing the tasks with kinship terms were not using some hypothetical ego as a reference point, as linguists and anthropologists do, but rather themselves. This is clear from the results on the ratings generation dimension as well as from subject comments in the sorting study ("*my* immediate family"). Subjects in both studies found the nuclear-extended family dimension more salient than *a priori* componential analyses have predicted. A nuclear-extended family feature might not be useful for a descriptive analysis of kinship terms but it certainly is psychologically salient for people who interact in families.

Subjects' judgements of the meaning of social sets can vary as they did with responses to the kinship terms. The variation in responses was more of degree than of kind. The subjects probably had a consistent interpretation of the relevant conventional responses but they differed on the relative salience which they assigned to those meaning components. The results from the kinship terms study, again, suggest a trade-off between the conventional and idiosyncratic meaning components. Social words must have certain conventionally determined meanings since they indicate the various relationships which hold between individuals. Kinship terms direct attention to affinal ties and social obligations, while personal pronouns define the interactive relations of the here-and-now.

The differential salience of the semantic components occurs because, within the general framework of a society, people may have different social experiences. Perhaps another set of meaning components would be salient for a different socio-economic group such as urban blacks in the United States. It is unfortunate that in the present study no information was collected about the subjects' family structure. `However, on the basis of previous literature, there was no reason to suspect that subject differences might occur.

In the previous section some speculations were presented about how evaluative and concrete words might be learned. Social words, like evaluative terms, are learned from human interactions, but the verbal labels are also explicitly presented, as for concete words. These labels are usually relative to the situation at hand, and it takes children a while to learn that a single person can have many different role names. They cannot understand, for example, how "Mommy" can also be a *sister* and a *daughter* all at the same time. Children can only consider mother's role in relation to themselves and probably do not view her as part of a larger extended family until they become older.

Children also have difficulty in switching pronoun roles. They must learn that pronouns mark conversational roles and are relative to who is speaking, and who is listening. When children acquire the meanings of kinship terms and personal pronouns they are not just learning linguistic labels, they are also learning how to behave appropriately in their society.

Conclusions

The experimental results reported in this chapter suggest some generalizations which can be drawn about studies in lexical meanings: 1) subject differences must be tested for before responses are analyzed, 2) the type of multivariate technique chosen to analyze the results does not necessarily reveal the true nature of the psychological constructs, and 3) frames of reference allow different latitude for the conventional interpretation of words.

The data reveal two ways in which subject responses can differ; differential salience can be attached to the same meaning components, or completely different meaning components can be perceived by a subset of the subjects. In the case of differential salience, all subjects use the same meaning components for making their rating judgements or sorting categorizations, they only differ in the relative importance they assign to the various meaning components. This is only natural, since it is obvious that not everyone thinks in exactly the same way.

The furniture words were the only lexical set where the subject groups appeared to perceive completely different meaning components. One reason that the different subgroups occurred might be that the subjects have encountered furniture in different contexts. Contextual information was limited in the experiment, so that subjects used the contexts most familiar to them as a basis for responding.

In some ways it is surprising that so many subject differences were discovered. From past experimental literature there would be no reason to think that subjects could vary in their responses, but then, few researchers have looked for subject groups before they pooled the data. Another reason that it would seem unlikely to find subject groups is that the subject population was quite homogeneous. Most of them were first or second year university students and were between 17 and 25 years old. It can probably also be assumed that these subjects have had many similar experiences, further contributing to the homogeneity of the subject sample. Much greater subject variation could be expected with a sample representing more different kinds of life experiences.

The conventional knowledge about meaning which subjects bring to experimental tasks inhibits them from responding totally idiosyncratically. The different frames of reference seem to allow different latitude in the interpetation of conventional meaning components. The evaluative frame allows for the least variation in responding conventionally. Perhaps because emotions are such intensely personal experiences language users find that they have a limited number of meaning components available by which they can share their emotions with others. For example, people would probably find it difficult to list a set of attributes which describe what it is like to *love* or to feel *anger*.

No such difficulty would occur for concrete words. Subjects can easily list appropriate attributes as Rosch's work has shown. Furthermore, when subjects are directed toward certain kinds of attributes, such as form or function, they are reasonably consistent among themselves as to which attributes are important. The interpretation of concrete words is more context dependent than for evaluative words, since there are more conventionally acceptable ways in which one can describe percepts derived from concrete experiences.

The social frame of reference falls somewhere between the evaluative and concete frames on the number of conventional meaning components available for interpreting word meanings. The interpretation of social words is, to some extent, context bound since the role assigned to a person (whether pronominal or kinship) depends on the situation he finds himself in. The referents of social words may shift during the course of conversation, but the role indicated by a social word must always be given the same interpretation, otherwise, confusion would arise as to who was doing what. For example, *I* is always the speaker, no matter who uses it at any given time.

The subjects responded with what they considered were the most conventionally appropriate meaning components. Statistical techniques cannot reveal the exact nature of these psychologically salient meaning components. Researchers often implicitly assume that the type of structure which results from a particular method of analysis corresponds to organization of the underlying cognitive structure. A great deal of effort is spent arguing about whether semantic components are cognitively represented as features or dimensions. The pronouns data show that both hierarchical clustering and multidimensional solutions produce similar results, suggesting that both kinds of representations may be appropriate for describing semantic components.

The form of the underlying representation seems to depend on the frame of reference used to judge the words. Words judged using the evaluative frame of reference seem to result in dimensional meaning components, since evaluations are usually a matter of degree. Concrete frames of reference, on the other hand, seem to be more compatible with a feature type of representation, since objects are usually categorized according to discretely perceptible attributes. Finally, the semantic components which result when a social frame of reference is used, seem to be compatible with either a featural or dimensional type of representation.

There may be other frames of reference corresponding to different types of underlying components than the three discussed here. The three frames discussed in this chapter seem to correspond to three important human activities: affective judgements, categorization, and social interactions. The experimental results reported in this chapter indicate the types of conventional meaning components subjects can assign to words. The next chapter presents experimental results which show idiosyncratic variation when there is insufficient information for subjects to access conventional meaning.

CHAPTER 7

EMPIRICAL EVIDENCE FOR CONVENTIONAL MEANING

Introduction

The studies in the previous chapter revealed conventionally determined meaning components. In these studies, the stimuli were presented in the context of other semantically related words, so the subjects had a fair idea of the proper interpretation to assign to the word meanings. Subjects were not given any such contextual cues in the first study reported below. Instead of receiving a set of lexical labels for judging or sorting, the subjects were asked to label auditory stimuli representing various environmental noises. Subjects had a general notion of the labels available, but they could not know beforehand which label was appropriate for each stimulus. The label assigned would depend on how the subjects interpreted a stimulus; when the source of the noise was clearly identifiable (such as a ticking clock), subjects responded consistently, but when the noise was less easily identified, the subjects responded idiosyncratically, some to the point of making up onomatopoetic words.

The second study reported below addresses a different problem, the relationship between a linguistic label and the percept which is the referent of that label. The most consistently labeled items from Experiment I were used as stimuli in a semantic differential rating task. Two groups of subjects participated in the second study; one group rated the auditory stimuli without knowing their lexical labels, while the other group rated lexical items without hearing the corresponding auditory stimuli. Both groups of subjects used acoustic parameters such as pitch and loudness in making their semantic differential rating judgements, suggesting that the meanings of the words and the auditory percepts had similar cognitive representations.

The experiments reported in this chapter used auditory rather than visual stimuli. Most of the research with concrete lexical fields has used concrete visible objects for presentation to the subjects. In many of Rosch's categorization studies (Rosch et al., 1976) and mental comparison tasks (Paivio & Marschark, 1980; Paivio, 1975; Banks & Flora, 1977) pictures of objects were used as stimuli. The research reported in this chapter is intended to show that experimental investigations of lexical labeling do not necessarily have to be confined to visual stimuli. Many of the types of studies which have been performed using pictures or real objects could also be conducted with auditory stimuli.

Sounds Labeling Study

In most psycholinguistic studies of semantic fields the lexical items used as stimuli are chosen based on the experimenter's intuitions about which words seem appropriate to his investigation. One of the aims of the present study was to let naive subjects determine which words belong to the semantic domain of sound terms, since the words produced by subjects during the labeling task must come from their lexical store of sound terms. Of the 100 items presented for labeling, it was hoped that a small set of stimuli would be consistently labeled with the same term. These words and their corresponding auditory stimuli could then be used in other experiments.

Subjects. Subjects were students enrolled in an introductory linguistics course and also staff and graduate students from the Linguistics Department at the University of Alberta. Thirty-two subjects participated in the study; two were later dropped because they were non-native speakers of English. The results were analyzed for 18 males and 12 females, 20 to 50 years old.

Stimuli. One-hundred test items were chosen from sound effects records or were produced by the experimeter in the acoustic laboratory. The stimuli were all sounds produced by inanimate objects, no human or animal vocalizations were represented. Some items had clearly identifiable labels, other noises had an identifiable source but no conventional name. For example, the noise a drill makes is readily recognizable although there is no generally accepted name for that noise. There were also a few items for which English speakers have conventional names; the noise of a car's horn is usually called *honk*, and a heartbeat is often labeled *thump*. The remaining items were chosen because they represented interesting noises.

Procedure. The 100 test items were recorded on magnetic tape, each with a duration of about five seconds. There was a ten second interval between stimuli. No sound was repeated, but there were often two or more representations of the same type of noise, a fact noticed by many subjects who seemed somewhat disturbed that they had used the same label for perceptually different noises.

Subjects were instructed to provide a name for each noise they heard but not to list the objects involved in its production. Complete instructions to the subjects are in Appendix A3. Subjects were provided with a list of noise words and were instructed to read through the list before the labeling task began. This list is also presented in Appendix A3. The purpose of the list was to remind subjects of possible responses available to them. Subjects were told that the list was by no means complete and they did not have to restrict their responses to items on the list. Subjects retained the list throughout the experiment and some referred to it before responding while others did not use it at all.

Three sample items were presented prior to the experimental task to insure that subjects understood what was expected of them. The practice items were chosen so that the noise source was clearly identifiable although there was no unique label for the noises produced. The examples were: 1) water pouring into a glass, for which subjects were told that they could respond with something like *slosh*, *splash*, or *glug*; 2) a gong, for which appropriate responses might be *gong*, *dong*, or *whang*; and 3) a train whistle, for which acceptable responses were *whistle*, *hoot*, or *woo*, but not train.

Subjects were tested in small groups over a period of three weeks. Their responses were tabulated to determine the frequency with which a label was assigned to a particular stimulus. It was decided that if a label for a particular item was produced by 40% or more of the subjects, the item would be considered to have a high degree of inter-subject agreement.

Results and Discussion

It was not expected that the subjects would agree on a single name for each of the 100 test items. It was hoped that good agreement could be found for 15 to 20 items. Eighteen stimuli were consistently labeled by approximately 40% or more of the subjects. The labels for these stimuli and their frequency of occurrence are shown in Table 7.1.

There were three patterns of response in the labeling task. The first type of response involved similarity of the phonological shape of the words and can be called onomatopoetic labeling. For example, the same test item elicited the following responses: *splash*, *splush*, *kerplash*, *slosh*, *sploosh*, *plashing*, and *swooshing*.

TABLE 7.1

LABELS FOR SOUNDS WITH 40% OR BETTER AGREEMENT FROM SUBJECTS

Item Label	Percent Agreement
Tick	100%
Buzz	93%
Ring (telephone)	93%
Tap	74%
Screech	73%
Crackle	70%
Bong	70%
Splash	67%
Whistle	67%
Rattle	62%
Jingle	60%
Squeak	57%
Crash	57%
Hum	50%
Honk	47%
Snap	47%
Clink	47%
Clang	43%

The second manner of responding involved semantic similarity where the responses seemed to share the same semantic features, although there was no common phonological shape for the words. One stimulus resulted in the following labels; *thunder*, *rumble*, *explosion*, *roar*, *crash*, and *clap*.

The last manner of responding was totally idiosyncratic. A single stimulus elicited the following responses:

tap, rat-a-tat, rattle, clop, thibble, clack, clicking, patter, ta-rump, clink, flap, plink, thunk, clunk, tullop, dingle, rapping, plop, cluttle, clapper, clip-clop, and *thunk-a-thunk*. The most difficult sounds to identify and label are in this last group.

Humans are highly dependent on visual information for identifying objects. Auditory stimuli presented in isolation contain fewer contextual cues for producing conventional labels than pictured objects. The consistent labels presented in Table 7.1 correspond to cases where the source of the noise was clearly identifiable, for example, a telephone or a clock. When the source is known, subjects can refer to the conventional label for that noise because they have a frame of reference for responding. In cases where the subject could not identify the source of the noise they had to rely solely on the acoustic cues. These items resulted in a wide variety of phonotactically acceptable but idiosyncratic responses, as the example given above shows.

In this study many of the noises, especially the most consistently labeled ones, were not necessarily autonomous of the objects which produced those noises. For example, what else usually makes a ticking noise besides a clock? This type of study could be used to investigate how subjects' expectations might influence the labeling task. Two groups of subjects could be presented with the same set of noises but each group could be told that a different type of object made those noises. It could then be determined how prior expectations affected labeling. Such an experiment could be used to illustrate the importance of context in indicating which words are appropriate for certain events.

Responses in the labeling task were particularly sensitive to subjects having begun to learn English from early childhood. One of the subjects was not a native speaker of English, but has what appears to be native speaker competence, to the extent that she has taught English as a second language in a foreign country. In the labeling study, however, this subject's responses were significantly different from the other subjects. For example, where 67% of the English speakers labeled a particular stimulus *whistle*, the non-native speaker responed */pIri/*. This form does not even seem to correspond to the usual phonological shape of an English word, but resembles the Spanish word for *whistle*, /pito/. Spanish was this subject's native language.

The sensitivity of the labeling task to native speaker competence supports the suggestion that language users tap their conventional knowledge of lexical meaning when a minimum of contextual cues are available. Conventional knowledge is probably learned at an early age from interactions within a linguistic community. If it could be determined what types of conventional knowledge are learned the earliest, it might be possible to develop a measure of competency for non-native speakers based on ability to respond like a native speaker. Of course, this is all highly speculative, and more research is necessary to determine how sensitive the labeling task is to native speaker competence.

Noises and Words

The second experiment used the 18 most consistently labeled stimuli from the labeling task. Two groups of subjects participated in this study. One group, henceforth called the auditory group, performed a semantic differential rating task on the acoustic stimuli without being aware of the labels assigned to those stimuli by the subjects in the first experiment. The other, lexical group, were given the same task but only had the 18 words as stimuli.

The aim of this study was to determine whether subjects would respond differently to the auditory and lexical stimuli. If the two groups do not respond differently this would provide evidence that the meanings of the linguistic stimuli are processed in a fashion similar to the meaningful responses to auditory stimuli.

Subjects. Twenty-nine subjects participated in this study, 12 were in the auditory group and 17 in the lexical group. They were 18 to 50 years old and were volunteers from the staff and students of the Linguistics Department. A few subjects in the auditory group had participated in the labeling task, but no subjects in the lexical group had any previous contact with the auditory stimuli used in the labeling experiment.

Stimuli. The 18 words from Table 7.1 served as stimuli for the lexical group and the noises corresponding to those labels were used as stimuli for the auditory group.

Procedure. Both groups of subjects were given a semantic differential task which involved rating concepts on several bipolar adjective scales. Many of the adjective scales have been used in previous semantic differential studies investigating the symbolic value of isolated speech sounds (Birch & Erickson, 1958; Slobin, 1968; Wicker, 1968). It was thought that these scales would also be appropriate for the environmental noises.

TABLE 7.2

FACTORS FROM AUDITORY AND LEXICAL SUBJECTS

Factors	Auditory Scale Weights		Lexical Scale Weights	
ONSET AND DURATION	Factor I		Factor I	
	sudden-gradual	.82	brief-continuing	.90
	brief-continuing	.74	sudden-gradual	.80
	fast-slow	.46		
	sharp-dull	.49		
	hard-soft	.52		
	rough-smooth	.50		
	angular-round	.54		
PERIODICITY	Factor II		Factor V	
	ordered-chaotic	.92	ordered-chaotic	.91
	simple-complex	.65	smooth-rough	.56
	distinct-vague	.53	simple-complex	.51
LOUDNESS	Factor III		Factor II	
	loud-soft	.82	soft-hard	.50
	strong-weak	.72	pleasant-unpleasant	.40
	large-small	.60	large-small	.75
			strong-weak	.79
			loud-soft	.84
QUALITY	Factor IV		Factor IV	
	light-dark	.46	light-dark	.57
	pleasant-unpleasant	.50	open-closed	.59
	open-closed	.51	pleasant-unpleasant	.37
PITCH	Factor V		Factor I	
	high-low	.70	dull-sharp	.64
	tense-relaxed	.54	rounded-angular	.53
	small-large	.49	wide-narrow	.51
	light-dark	.44	relaxed-tense	.50
	narrow-wide	.49	low-high	.66

The lexical group of subjects received a booklet with 18 pages; each page has a different word printed at the top with 20 bipolar scales below. The order of pages was randomized for each subject, although the order of scales remained constant throughout the study. The subjects were given the booklets to take home and complete at their convenience.

The auditory subjects received the same booklet except that no words were printed at the top of each page. These subjects heard one of the noises on the tape recording and rated it on all 20 scales. Then, they listened to the next sound and continued until all 18 noises had been rated. These subjects were tested individually in the laboratory.

The instructions to the subjects were basically the same for each group except the lexical subjects were told to base their ratings on the meanings (this was not defined) of the words. The auditory group was asked to respond to the noise they heard, not their feelings about the objects which made those sounds. In addition, as a check on subject agreement, the auditory group was asked to identify the source of each sound. Instructions to the subjects as well as the adjective scales used can be found in Appendix A4.

Results and Discussion

The semantic differential experiment was intended as a pilot study for a larger project which was never completed. This study was to include a comparison of the acoustic properties of noises and sound words, but technical problems did not allow for the desired acoustic analysis. The sounds study is reported here because it suggests some interesting aspects of word meanings in relation to their referents. However, the following factor analysis should be considered a tentative representation of the results since there was such a small number of subjects who participated in the study. Factor analysis is usually only appropriate with a larger n than used in the present study.

The data were analyzed using principal factors analysis, the standard statistical procedure for semantic differential data. A five factor solution was appropriate for both groups; for the lexical subjects five factors accounted for 65% of the total variance, and 67.9% of the variance was accounted for by the five auditory factors. The five factors appear to be the same for each group: Pitch, Onset & Duration, Loudness, Periodicity, and Quality.

Table 7.2 presents the factors for each group. All of the rating scales had a high weight for at least one factor except *warm-cool*. The highest weight for this scale was .31 on the lexical Factor I, and -.34 on auditory Factor I. Neither subject group found this scale relevant for rating noises or noise words. In Chapter 3 it was noted that when the stimuli come from a homogeneous group the semantic differential rating scales are more likely to be treated referentially than metaphorically. *Warm-cool* could not be interpreted referentially for the auditory stimuli so this scale was ignored by most of the subjects who used ratings from the midpoint of the scale. The average ratings for the 18 lexical stimuli ranged from 3.18 to 4.76, and from 3.33 to 4.75 for the auditory stimuli.

Table 7.3 shows the strongest correlations between factors from both groups. Except for one case, each lexical factor mapped onto one auditory factor. The auditory Onset & Duration factor correlates with both the lexical Pitch and Onset & Duration factors. Also, within each group the Onset & Duration factors correlate strongly with the Pitch factors. For the correlation between the auditory Pitch and Onset & Duration factors, r = .64. The correlation between the lexical Pitch and Onset & Duration factors is r = -.40.

The strong correlations between pitch and duration factors could have resulted from the choice of stimuli. In reviewing the auditory stimuli it became apparent that the low pitch sounds were, for the most part, continuous (e.g, *hum*), while the high pitch sounds were periodic (e.g., *jingle*), or discrete (e.g., *squeak*).

The average factor scores for each word were also calculated. These data are presented in Table 7.4 and were most helpful in the interpretation of the factors. The reader is reminded that the labels in Table 7.4 for the auditory data only represent the names assigned to the stimuli by subjects in the labeling task. Subjects in the auditory group were not aware of the labels corresponding to the noises that they heard.

To further aid interpreting the factors some physical measurements were made of the auditory stimuli. These measurements can be mapped onto the factors through the average factor scores of the auditory stimuli. The acoustic measurements indicated that the *whistle* stimulus has a high pitch while *bong* and *hum* are low pitch (the *hum* was actually a 200 cps oscillator tone). As would be expected, *whistle* occurs at one end of the Pitch factor with *bong* and *hum* at the opposite pole.

TABLE 7.3

CORRELATIONS BETWEEN AUDITORY AND LEXICAL FACTORS

Factor Name	Auditory	Lexical	Correlation
Onset & Duration	I I	III I (Pitch)	-.86 -.54
Periodicity	II	V	.81
Loudness	III	II	-.96
Quality	IV	IV	.86
Pitch	V	I	.90

The auditory factor scores in Table 7.4 show that *tick* is very quiet while *bong* was rated as very loud. The acoustic measurements support the placement of these noises on the auditory Loudness factor. The data for the lexical Loudness factor show that *crash* was ideally the loudest sound even though the corresponding auditory item was not particularly loud on the tape recording. The auditory stimuli were not controlled for loudness. In spite of this, some of the auditory subjects reported that they compensated for differential loudness of the stimuli by placing certain sounds near or far away from them. If a normally quiet sound seemed unusually loud, the subjects assumed that it was close by, whereas a quiet instance of a normally loud noise was assumed to be farther away than usual.

This strategy for responding suggests two things; 1) the auditory stimuli were just as meaningful as the linguistic labels, and 2) subjects use their past experiences as an aid to completing the task. Unfortunately for the experimenter, subjects do not passively respond to the stimuli presented in the laboratory. As with every other aspect of their life, they expect stimuli to be meaningful and attempt to interpret the experimental stimuli in terms of their past experiences. I think that it is probably impossible to present experimental subjects with totally meaningless stimuli.

The Quality factor is an evaluative factor which represents the subject's feelings about the noises and referents of noise words. It is not clear what acoustic measures, if any, would correlate with Quality. The implication of this factor also is that environmental stimuli are meaningful and not simple auditory events which impinge on the auditory system.

TABLE 7.4

FACTOR SCORES FOR THE AUDITORY AND LEXICAL STIMULI

Auditory Presentation

Onset & Duration		Periodicity		Loudness		Quality		Pitch	
tap	-.95	snap	-1.22	bong	-.97	splash	-.93	whistle	-1.15
crash	-.77	tick	-1.04	clang	-.90	bong	-.54	ring	-.89
whistle	-.60	tap	-.89	ring	-.77	jingle	-.47	jingle	-.77
snap	-.57	clink	-.72	screech	-.75	snap	-.47	tick	-.53
screech	-.47	clang	-.68	buzz	-.70	clink	-.46	squeak	-.52
rattle	-.34	bong	-.52	crackle	-.69	clang	-.42	screech	-.50
tick	-.34	hum	-.27	honk	-.63	tick	-.24	tap	-.47
jingle	-.33	honk	-.13	crash	-.57	rattle	-.20	snap	-.31
clink	-.29	rattle	-.14	whistle	-.16	tap	-.14	rattle	-.29
ring	-.29	ring	.29	hum	.20	whistle	-.12	clang	-.01
clang	-.01	jingle	.33	splash	.37	honk	.18	clink	.00
buzz	.03	buzz	.34	tap	.36	crash	.21	crash	.04
squeak	.03	whistle	.35	jingle	.38	ring	.39	buzz	.34
honk	.10	squeak	.59	clink	.77	squeak	.43	honk	.36
crackle	.65	screech	.73	squeak	.81	hum	.53	crackle	.47
splash	.86	splash	.78	snap	.86	screech	.57	splash	1.16
bong	1.48	crash	1.08	rattle	1.04	crackle	.62	hum	1.46
hum	1.82	crackle	1.11	tick	1.33	buzz	1.06	bong	1.62

Table 7.4 is continued on the next page

Lexical Presentation

Onset & Duration		Periodicity		Loudness		Quality		Pitch	
snap	-1.08	tick	-.78	tap	-1.11	jingle	-.74	bong	-1.41
clink	-.93	tap	-.76	tick	-1.04	ring	-.70	hum	-1.36
crash	-.63	hum	-.72	clink	-.91	whistle	-.54	splash	-.58
tap	-.60	bong	-.59	jingle	-.77	splash	-.41	buzz	-.41
honk	-.46	ring	-.44	hum	-.71	crackle	-.34	tap	-.41
squeak	-.43	whistle	-.32	squeak	-.64	clink	-.24	honk	-.24
tick	-.33	snap	-.30	crackle	-.38	tap	-.19	rattle	-.15
splash	-.24	honk	-.21	snap	-.12	hum	.01	clang	.10
screech	-.23	clink	-.18	whistle	-.06	bong	.02	tick	.10
clang	-.16	jingle	-.10	buzz	-.01	rattle	.17	ring	.17
crackle	.00	buzz	.17	rattle	.01	tick	.21	crash	.26
ring	.19	squeak	.28	splash	.09	clang	.27	crackle	.27
jingle	.29	clang	.36	ring	.20	squeak	.27	jingle	.30
whistle	.44	splash	.36	honk	.94	snap	.28	whistle	.38
bong	.59	rattle	.50	screech	.98	screech	.33	snap	.47
rattle	.66	crackle	.61	clang	1.02	honk	.42	clink	.49
buzz	1.27	screech	.83	bong	1.10	buzz	.47	squeak	.88
hum	1.58	crash	1.31	crash	1.26	crash	.58	screech	1.15

It is perhaps not surprising that the salient features for the auditory group are Pitch, Loudness, Periodicity, and Duration. These characteristics are usually measured when the physical attributes of sounds are described. It is interesting, however, that these factors also occur for the lexical data. The lexical subject group must have been basing their ratings on an idealized referent for each word. The data in conjunction with subjects' comments suggest that both groups of subjects were using the same kind of internal representation for performing the semantic differential task. Lexical subjects made reference to physical attributes while the auditory group interpreted meaningful aspects of the stimuli. Some of the auditory subjects said that their ratings were partly based on how they felt about the objects which produced the noises; for example, some people have strong reactions to ringing telephones.

If the two groups of subjects had produced totally different results there might be some evidence for a uniquely linguistic component of meaning distinct from affective or referential meaning. An objection to the present interpretation of the results might be that the reason both subject groups produced the same set of semantic factors is that the same set of semantic differential scales were used in each case. However, if there were a separate linguistic meaning component for words, it should be expected that the rating scales would be interpreted differently (perhaps metaphorically) for the lexical than the auditory stimuli. The previous chapter suggested that concrete words are interpreted with a concrete frame of reference; the results reported in this chapter indicate that real world concrete stimuli may also be interpreted with the same type of frame used for words.

Conclusion

The experiments reported in this chapter have attempted to investigate the connection between physical and lexical stimuli. The results suggest that the relationship between lexical items and their referents is mediated by cognition. Subjects in the auditory group were not simply responding to the acoustic features of the noises, instead physical stimuli become meaningful when they fit into some frame of reference; which is possible when the context of a noise can be established. The minimal context necessary in this study was identification of the source of each noise. The results also suggest that the same or similar frames of reference were used by both the lexical and auditory groups.

Choosing an appropriate frame of reference depends on having some contextual information available. In most of the studies reported in Chapter 6 there was enough contextual information so that subjects could provide a conventional response about the meanings of words presented to them. In the sounds labeling study, however, many of the stimuli could not be placed in an appropriate context. In these stituations subjects produce idiosyncratic responses. The only frame of reference they had available was themselves, so the subjects gave responses unique to them.

CHAPTER 8

LEXICAL MEANING AND COGNITIVE PROCESSES

Introduction

The preceding chapters were intended to show how complicated lexical semantics can be. The most important point established is that words do not have inherent, fixed meanings. Rather, they are interpreted by language users who make use of their past experiences and contextual information for this task. Even though semantic interpretation can be highly personal, total anarchy does not occur within a communicating society because conventionally accepted interpretations constrain how meaning is conveyed within a community.

The experimental evidence reported in Chapters 6 and 7 indicates that subjects may respond according to how they interpret the situation in which they find themselves. Furthermore, they appear to respond differently to different types of lexical fields. Concrete sets, in particular, are treated in a distinctive manner. The current chapter presents some speculations which have been suggested by my interpretation of the experimental results but which are not necessarily supported by the empirical evidence. It is also a review of what I consider to be the most important aspects of lexical semantics. The first section discusses the nature of processing theories of cognition, then cognitive strategies for the interpretation of word meanings are considered. The chapter ends with some remarks about the experimental procedures in addition to some suggestions for the practical application of semantic similarity studies.

Cognitive Processes

In the past, cognitive abilities have generally been described as if they were mental states or structures. The meanings of words were assumed to be stored in a mental lexicon, usually having some kind of hierarchic organization. It was also assumed that if a language user needed to know the meaning of a word, he looked it up in his subjective lexicon much as he would look up a word in a standard desk dictionary. This static notion of cognition is being revised by contemporary cognitive psychologists in favor of a processing view of cognition (Craik, 1982; Bransford et al., 1977; Caramazza & Grober, 1976; Jenkins, 1977; Neisser, 1976). There is, to date, no well-developed theory about cognitive processes; the current trend is a novel way of thinking about human psychology; people are considered to be actively involved in perceiving and understanding their world. Experiences do not simply impinge on the individual, they are assimilated and categorized by him. At the same time, cognition is not considered to be a series of connected states, but rather, mental activities which are often directed by contextual cues.

Processing theories are difficult to formulate because researchers can only observe the end products of processes, not the processes themselves. These products invariably look like states, which has probably been the reason that static theories have been favored over active ones. It is difficult to conceptualize the mind as being totally active and processing theorists do not deny that there must be some structured store of information. However, the processing view assumes that similar kinds of information are not always interpreted exactly the same way; people are much more influenced by context than has been supposed. Humans actively attempt to make sense of the particular circumstances in which they participate, and therefore, are selective in what they pay attention to in any given situation. This gives the individual flexibility in dealing with his environment, since he can adapt his reactions to the conditions at hand.

The notions of conventional and idiosyncratic meaning are closely linked to a processing view of cognition. These two types of meaning represent modes of responding based on an individual's assessement of a situation. I have assumed that the type of interpretation assigned to a word will depend on what a person feels is appropriate in a particular context. The subjects who participated in the experiments reported in Chapter 6 attempted to supply what they felt were conventional meanings since they recognized that this is what is usually required in an experimental setting. In the sounds labeling study, on the other hand, subjects did not have enough information to supply conventional responses. It cannot be assumed that subjects approach experimental tasks without wondering about what the experimenter is looking for, especially when the subjects are university undergraduates who are well aware of the general purposes behind psychological studies. For this reason, I would hesitate to claim that the experimental results obtained would apply to a general population of English speakers. One would have to use several different types of subject pools in order to determine how generalizable the results are.

The nature of idiosyncratic and conventional modes of semantic interpretation should be more fully explored. The kinship terms might lend themselves well to this task since families have both social and personal facets. An experiment might be devised to force subjects to respond idiosyncratically to the kinship terms. Subjects could be asked, for example, to sort or rate the kinship terms with reference to their own families. A greater degree of intersubjective variation could be expected than was found for the experiments in Chapter 6. In such a study it would be important to gather information about a subject's attitudes toward his family in order to be able to determine what led to different types of organization.

Frame of Reference Strategies

A current trend in psycholinguistics and related disciplines is to look for organizational principles or strategies which may be applied to the interpretation of utterances. These organizational strategies have many different names (e.g., schema, script, frame, or cognitive strategies), and range in application from an analysis of situations (Winograd, 1981) to generalizations about specific linguistic devices (Bybee & Slobin, 1982). These various interpretations seem to represent hypotheses about processing and indicate a general recognition that understanding language requires the ability to integrate utterances with non-linguistic knowledge about the world. In the context of lexical semantics, I have proposed frames of reference as organizational principles for processing related sets of meaningful stimuli.

The frames of reference hypothesized for the lexical fields in Chapter 6 were based on the information that the stimuli were semantically related. The subjects established what type of field they were dealing with and then determined an appropriate manner for organizing that field. Emotion terms, for example, were organized according to evaluations while concrete words were organized by place used and function. Finally, social words were organized using an "I" perspective of the various relationships.

Since the pre-established hypotheses are only appropriate for particular contexts, the frames of reference discussed in Chapters 4 and 6 may only be relevant strategies for lexical sets in isolation and for the particular tasks assigned to the subjects. The experimental results have provided no information about how word meanings might be processed in sentences. In the experimental studies reported in Chapter 6, the subjects knew that no message was intended by the stimuli and the interpretive frames of reference established were probably more general than would be the case for specific utterances in context.

The notion of frame of reference could be extended beyond its application to lexical sets. There may be a general strategy for establishing an appropriate frame of reference to interpret stimuli occurring in a particular situation. This general frame of reference strategy might be formulated as follows:

> *Given this particular context what kinds of stimuli are most likely to occur, and which interpretations of these stimuli are most likely to be correct?*

This strategy gives the individual an active role in assessing and interpreting his environment. The particular frames of reference established represent hypotheses formulated from contextual cues, which set modes for categorizing new stimuli. In a way, a person guesses at the kinds of information he will be receiving and tries to determine the most appropriate responses.

When presented with a lexical item, the language user must first determine if it is familiar and if it is consonant with his pre-established frame of reference. If everything is in order he can appropriately interpret the intended meaning. If the language user is operating with the wrong frame of reference communication will not take place successfully, and he must reassess the situation and come up with a new frame of reference. Lexical ambiguity occurs when the participants in a conversation are working with two different frames of reference. One of the individuals, usually the hearer, must reorient himself and try to establish the same frame of reference as the speaker in order for successful communication to take place.

The Experiments

The preceding discussion has been highly speculative, this section will take on a practical tone to discuss some substantive aspects of the experimental studies reported in Chapters 6 and 7. The different types of responses to concrete and abstract lexical fields are, I think, one of the more interesting results of the experimental studies. To my knowledge, this is one of the few studies where the same data gathering and analytic techniques were applied to abstract, concrete, and social sets of words. Fillenbaum and Rapoport's (1971) study was similar but they did not present an in-depth interpretation of their results, nor did they attempt to relate their data to a theory of lexical semantics. Perhaps more studies with different sorts of lexical stimuli would help reveal the cognitive differences among various kinds of lexical fields. One approach might be to get subjects to list relevant attributes for the words in each field and for the field as a whole. If the speculations in Chapter 6 about the conventional aspects of concrete and abstract fields are correct, more subjects should list a greater number of the same attributes for concrete than for evaluative words, because concrete objects have more conventionally acceptable attributes associated with them.

Another important innovation in the experimental research presented in Chapter 6 was that subject differences were sought before the data were pooled across subjects. The results show that in studies involving meaning it is unlikely that all subjects will respond in the same way. Although it can be assumed that subjects will try to respond conventionally, it must also be recognized that different subjects may have different notions about appropriate conventional responses. Further research in this area should extensively question subjects about their experiences relevant to the field under investigation. For example, if the set were labels for tools, subjects could be asked to provide information about their previous experiences in woodworking or gardening. This information could provide a basis for interpreting the various subject groups which might occur.

The research presented in Chapter 6 can have a practical application toward teaching languages to non-native speakers. Similarity ratings and sorting judgements produce results which indicate how some native speakers organize a particular lexical set. An awareness of this organization may aid language teachers in showing their students how the meanings of words in a lexical field are related. This can be especially useful when the students' native language lacks a certain lexical field. For example, some Japanese students mentioned that they found English verbs of prediction (e.g., *wonder if*, *believe*, *think*, *guess*) most confusing since their language did not have lexical items for so many different distinctions. Showing them how English speakers organized these words may help the Japanese speakers to sort out this unfamiliar lexical set (Marckworth et al., 1981).

The relationship between words and their referents should also be further explored. The instructions for the semantic sorting studies (Appendix A2) asked the subjects to sort the words according to the characteristics of the objects represented by those words. These instructions were designed to prevent sorting according to the word forms rather than their meaning. Perhaps this was a mistake, since it is conceivable that a different sorting might have resulted if the subjects had been asked to consider the meanings of the words rather than the objects which are their referents. The sorting subjects generally appeared to sort by the same criteria used by the rating subjects to make their semantic similarity judgements, so the sorting instructions probably did not lead subjects away from a consideration of the meanings of the words. The relationship between word forms, lexical meanings, and real world objects has not been experimentally investigated. The sorting method provides a good technique for comparing across these different aspects of the lexicon. Studies in this area might reveal aspects of lexical organization different from those discussed in this dissertation.

Conclusion

I have come to the rather unhappy conclusion that lexical meaning cannot be fully understood until human cognition is explained since much of what has been said here about lexical semantics seems to apply to cognitive processes in general. The main area of concern in this dissertation has been lexical semantics and I have tried to limit the discussion to that topic as much as possible.

The meanings of linguistic labels may be interpreted in much the same way that other kinds of meaningful stimuli are interpreted, but words are unique in providing us with powerful devices for sharing our experiences. Language users can talk about things not-here and not-now, as well as internal personal experiences which otherwise could never be shared with anyone else. There is also no doubt that having lexical labels available influences the way we categorize our environment. In one of the classic problem solving studies subjects are given a candle, a box of tacks, and a book of matches (Glucksberg & Weisberg, 1966). They are instructed to attach the candle to the wall so that it does not drip wax on the floor as it burns. In order to solve the problem the subjects must view the box as a possible candle holder and not merely as a container for the tacks. When each object was clearly labeled, subjects took an average of 0.61 minutes to find the correct solution. Without labels the average time to correctly solve the problem was 8.82 minutes. The lexical labels seemed to help the subjects to view the box as a separate component from the tacks.

These experimental results can be interpreted with the frame of reference strategy proposed earlier. Having the labels available may have given the subjects clues for formulating the appropriate frame of reference for responding. It would be interesting to see how subjects would approach the task if the objects were labeled in greater detail, for example, *wick, wax, box top, sides,* etc. Perhaps in this case subjects would be led astray into establishing an inappropriate frame of reference and the labels would not facilitate solving the problem.

The first chapter began by saying that words seem to be independent devices for communicating. Words are communicating devices but their power comes from the language users who know how to use and interpret them appropriately. This dissertation has been, in part, an attempt at persuasion that language users ought to be recognized as active participants in interpreting their environment and for knowing how to communicate their intended messages. Perhaps psycholinguistics has been on the wrong track in looking at the products of communication rather than examining the strategies and techniques employed by the producers.

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APPENDIX A1

SAMPLE INSTRUCTIONS FOR THE SEMANTIC SIMILARITY STUDIES

The purpose of this study is to collect information about your judgements of meaning similarity between words. You will be asked to consider the relative similarity in meaning of a related group of words. In this experiment you will judge words representing *emotions*. The words will be presented in a table like the one below for a set of temperature words.

	COLD	WARM	COOL	HOT	FRIGID	TEPID
BOILING	[8]	[4]	[8]	[1]	[9]	[6]
COLD		[7]	[2]	[8]	[1]	[5]
WARM			[7]	[3]	[8]	[4]
COOL				[8]	[3]	[6]
HOT					[9]	[6]
FRIGID						[7]
TEPID						

Notice that each box links a pair of words. You are to judge each word pair for general similarity of meaning on a

1-9 scale. Before you begin, scan the entire list of words, then look at every possible pair and find one for which you think the words are most similar in meaning. Put a "1" in the box corresponding to this pair. Now, find a pair that you think is least similar in meaning. Put a "9" in that box. These are anchor points for judging the other word pairs.

Now fill in the other boxes with your estimates of similarity of meaning. You may use any values in the 1-9 scale that correspond to your judgements about relative similarity of meaning. Keep in mind that low numbers are for more similarity of meaning (nearer) and higher numbers represent less similarity in meaning (further apart). Do not hesitate to use 1 or 9 again if you feel these values are appropriate for any other pair of words. Work until all the boxes are filled in.

The sample set for temperature terms has been filled in for you. Please look at it carefully. Do you have any questions at this point about how the 1-9 rating scale is to be used?

There is no time limit and there is, of course, no "correct" answer. We are interested in finding out how users of the language perceive the relative similarity among *emotions*. Therefore, the only correct response is the one which represents, as precisely as possible, the way *you* see the relationships.

The judgements you are making are not absolute, but simply relative to the set of terms actually given to you. Restrict your attention, then, solely to the words given.

Please read through the entire list of words. It is extremely important for this experiment that each of you is quite certain that he or she knows the meaning of all of the words. If there is any doubt about the meaning of a word, please do not hesitate to ask the experimenter before proceeding to evaluate the pairs. If you have any questions ask them now.

REMEMBER:

1 = most similar (words are close in meaning)
9 = least similar (words are far apart in meaning)

First, scan the entire list and find the pair (or pairs) which is most similar in meaning and assign "1" for that pair.

Then, scan the entire list and find the pair (or pairs) which is least similar in meaning and assign it a "9" rating.

Now, fill in the remaining boxes with values ranging from 1 to 9 inclusive, that best represent your judgement of the similarity of meaning for each of the word pairs.

APPENDIX A2

SAMPLE INSTRUCTIONS FOR THE SORTING STUDIES

The purpose of this study is to discover the relationships or groupings people can find among some common objects. You have a set of cards with words representing different kinds of *furniture*. First, read through the entire set of cards. Then, sort them into groups based on characteristics of the objects represented by the words. All of the items in a group should have something(s) in common.

You may sort in any way you wish but **do not** sort into **less than two** or **more than six** groups. You may have any number of items in a particular group, and the cards do not have to be evenly divided among your groups. Be sure to think about the similarities of the actual objects represented by the words rather than similarities of the word forms.

Sometimes one item may appear to belong to more than one group. You will have to decide to the best of your ability where to put it. Take your time. This is not a test of speed in sorting.

After you have finished sorting write your groups on the back of the subject information sheet. Label them A, B, C, etc. Be sure to keep the groups distinct and be accurate in copying down the item in a group. Then insert a blue card between each group of cards and give your information sheet and cards to the experimenter.

SUMMARY

1. Read through the set of cards.

2. Sort the cards into 2-6 groups based on the similarities of the objects represented by the words.

3. Write down your groups. **BE ACCURATE**

4. Insert a blue card between the groups of cards and put them in the envelope.

Thank you.

APPENDIX A3

SAMPLE INSTRUCTIONS FOR THE SOUNDS LABELING STUDY

In this experiment you will be asked to identify a variety of different sounds. They will all be noises produced by inanimate objects and not sounds from human or animal vocalizations. You will hear a sound and then you should write down the name of that sound. Be sure to give the name of the *noise* and not the name of the object(s) which were involved in its production.

To give you an idea of the kind of sound words you might use, take a few minutes to read over the list in front of you. This list contains a few suggestions and its purpose is to refresh your memory about the various sound words available to English speakers. Please do not feel constrained by the words on this list, you may use any sound word which you feel is appropriate for the noise you hear, and you may use any label more than once. You may also use general terms such as *sound* or *noise* if you feel that is the best label for a particular stimulus.

(Read list)

Now, just to review the procedure: 1) First you will hear the number of the test item. There are 100 altogether. 2) Then you will hear a noise, and you should write down the name of that sound next to the appropriate number on your answer sheet. Each sound will be presented for approximately 5 seconds to give you a chance to identify it. Some of the noises are repetitive, for example tapping, and some of them are continuous such as hum. Do not let this confuse you, for the repetitive sounds you should give the name of one instance of the series.

Before you begin the actual test items you will have three sample stimuli so that you will have a clearer understanding of the requirements of the task. After the three examples, I will stop the tape and you can ask any questions you might have about the procedure.

SOUNDS WORD LIST PRESENTED TO SUBJECTS DURING THE SOUNDS LABELING TASK

babble
bam
bang
barrage
beat
beep
belch
bellow
blare
blast
boing
boink
bomination
bong
boom
brr
burst
buzz
cackle
chime
chink
chirp
chug
clamour
clang
clangor
clap
clash
clatter
click
clink
clop
cluck
clunk
cough
crack
crackle
crash
creak
croak
crunch
din
ding
dong
drip
drone
explosion
fizz
fizzle
flap
flutter
gasp
glug
grate
groan
grumble
gurgle
gush
hiss
holler

honk
hoot
howl
hum
hush
jangle
jingle
kapow
kerplunk
knock
kush
music
murmur
noise
patter
peal
peep
pff
ping
pit-a-pat
pitter
plash
plink
plop
plunk
pop
poof
pow
psst
puff
putt
racket
rap
rasp
rat-a-tat
rattle
ruckus
rend
report
resound
ring
rip
roar
rumble
rustle
scrape
scratch
scream
screech
scuffle
scrunch
shatter
shriek
sigh
sizzle
slam
slap
slosh
slurp
smack
smash
snap
sneeze
sniffle
snort
snuffle
sound
splash
sproing
sputter
squeak
squeal

static
swell
swish
swoosh
tap
tear
thonk
thud
thump
thunk
thunder
thwack
tick
tinkle
tintinabulation
tone
toot
trill
twang
tweet
twitter
uproar
wail
whack
whamp
whang
wheeze
whine
whirr
whistle
whizz
whoosh
zap
zing
zip
zoom
zonk

APPENDIX A4

INSTRUCTIONS FOR THE SOUNDS STUDY SEMANTIC DIFFERENTIAL TASK

The purpose of this study is to measure the *meanings* of certain things to various people by having them judge words against a series of descriptive scales. On each page of this booklet you will find a different concept to be judged and beneath it a set of scales. You are to rate the concept on each of these scales in order. Each of the words to be rated represents a sound produced by an inanimate object. They are not sounds from human or animal vocalizations. Please keep this in mind as you make your rating judgements.

Here is how you are to use these scales:

If you feel that the concept at the top of the page is *very closely related* to one end of the scale, you should circle number 1 or number 7.

fast ①----2-----3-----4-----5-----6-----7 slow

fast 1-----2-----3-----4-----5-----6----⑦ slow

If you feel that the concept is *quite closely related* to one or the other end of the scale (but not extremely), you should circle number 2 or number 6.

loud 1----②----3-----4-----5-----6-----7 soft

loud 1-----2-----3-----4-----5----⑥----7 soft

If the concept seems *only slightly related* to one side as opposed to the other side (but is not really neutral), then you should circle number 3 or number 5.

dull 1-----2----[✓ 3]----4-----5-----6-----7 sharp
dull 1-----2-----3-----4----[✓ 5]----6-----7 sharp

The direction toward which you circle, of course depends upon which of the two ends of the scale seems most characteristic of the thing you're judging.

If you consider the concept to be *neutral* on the scale, both sides of the scale *equally associated* with the concept, or if the scale is *completely irrelevant*, unrelated to the term, then you should circle number 4.

Sometimes you may feel as though you've had the same item before on the test. This will not be the case, so *do not look back and forth* through the items. Do not try to remember how you checked similar items earlier in the test. *Make each item a separate and independent judgement* . Work at fairly high speed through this test. Do not worry or puzzle over individual items. It is your first impressions, the immediate 'feelings' about the items, that we want. On the other hand, please do not be careless, because we want your true impressions.

SCALES USED FOR THE SEMANTIC DIFFERENTIAL TASK ON NOISES AND NOISE WORDS

SMALL 1-----2-----3-----4-----5-----6-----7 LARGE

HIGH 1-----2-----3-----4-----5-----6-----7 LOW

ROUNDED 1-----2-----3-----4-----5-----6-----7 ANGULAR

LOUD 1-----2-----3-----4-----5-----6-----7 SOFT

SUDDEN 1-----2-----3-----4-----5-----6-----7 GRADUAL

WARM 1-----2-----3-----4-----5-----6-----7 COOL

LIGHT 1-----2-----3-----4-----5-----6-----7 DARK

OPEN 1-----2-----3-----4-----5-----6-----7 CLOSED

BRIEF 1-----2-----3-----4-----5-----6-----7 CONTINUING

SOFT 1-----2-----3-----4-----5-----6-----7 HARD

SIMPLE 1-----2-----3-----4-----5-----6-----7 COMPLEX

DULL 1-----2-----3-----4-----5-----6-----7 SHARP

FAST 1-----2-----3-----4-----5-----6-----7 SLOW

PLEASANT 1-----2-----3-----4-----5-----6-----7 UNPLEASANT

DISTINCT 1-----2-----3-----4-----5-----6-----7 VAGUE

SMOOTH 1-----2-----3-----4-----5-----6-----7 ROUGH

STRONG 1-----2-----3-----4-----5-----6-----7 WEAK

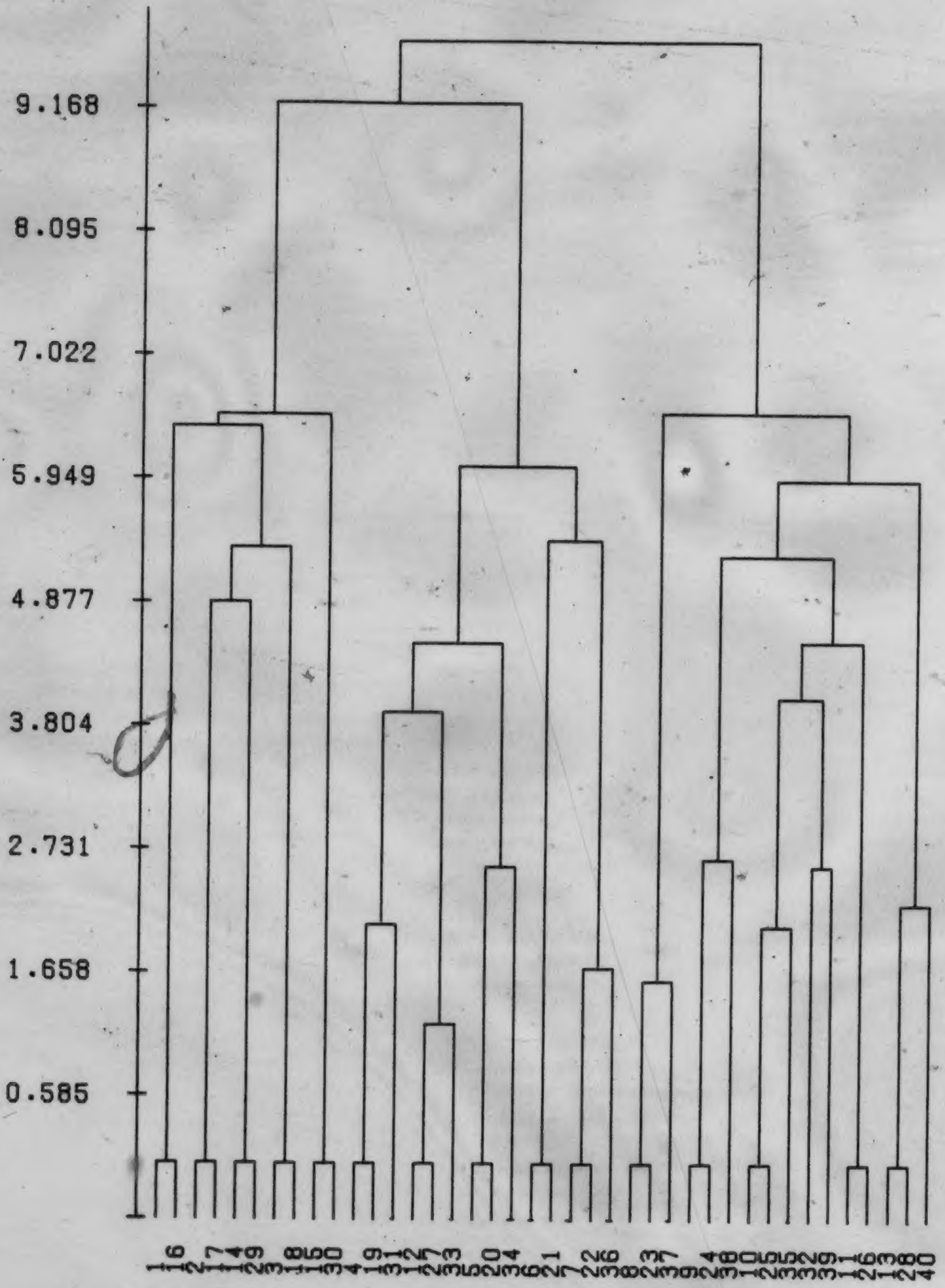
ORDERED 1-----2-----3-----4-----5-----6-----7 CHAOTIC

WIDE 1-----2-----3-----4-----5-----6-----7 NARROW

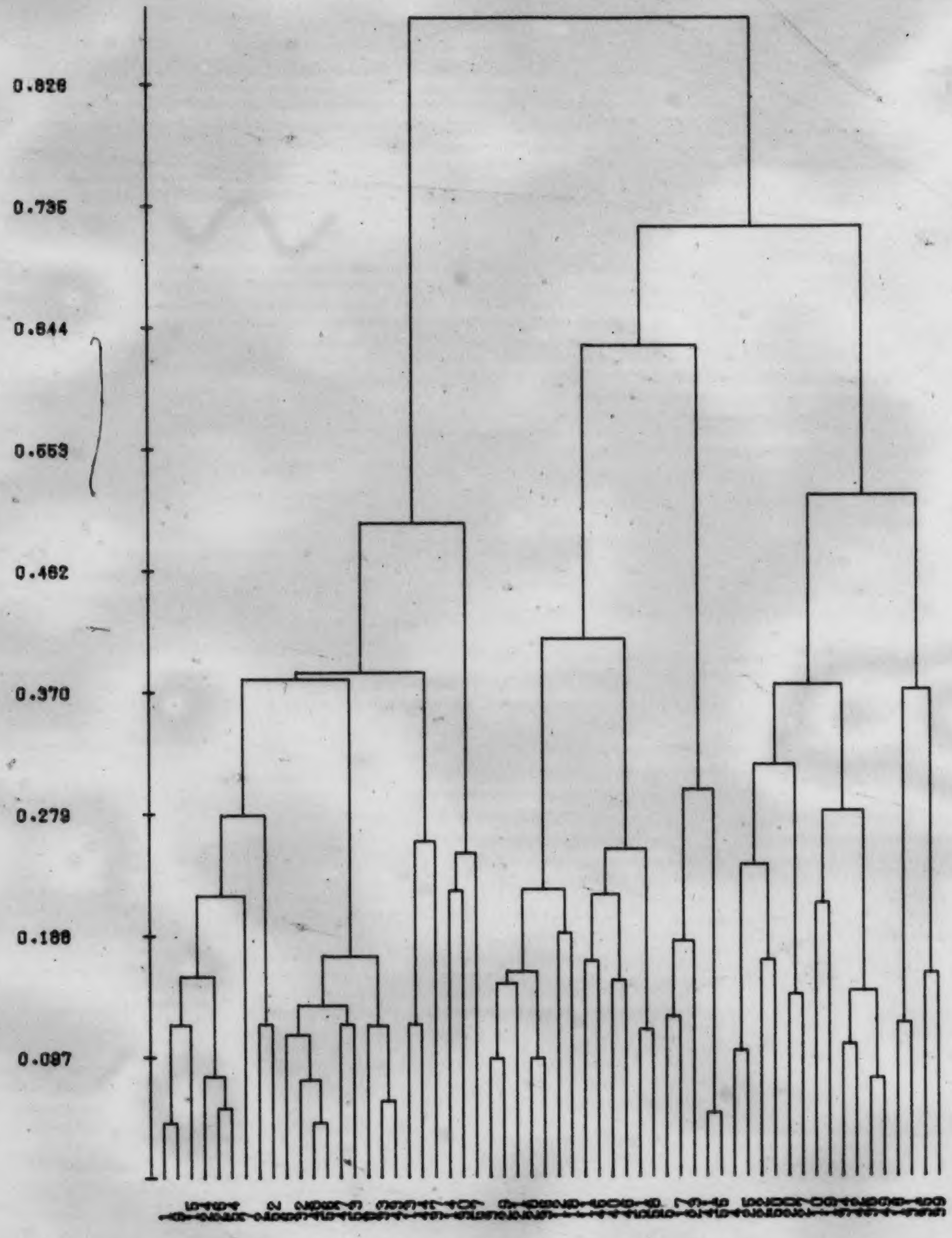
TENSE 1-----2-----3-----4-----5-----6-----7 RELAXED

APPENDIX B

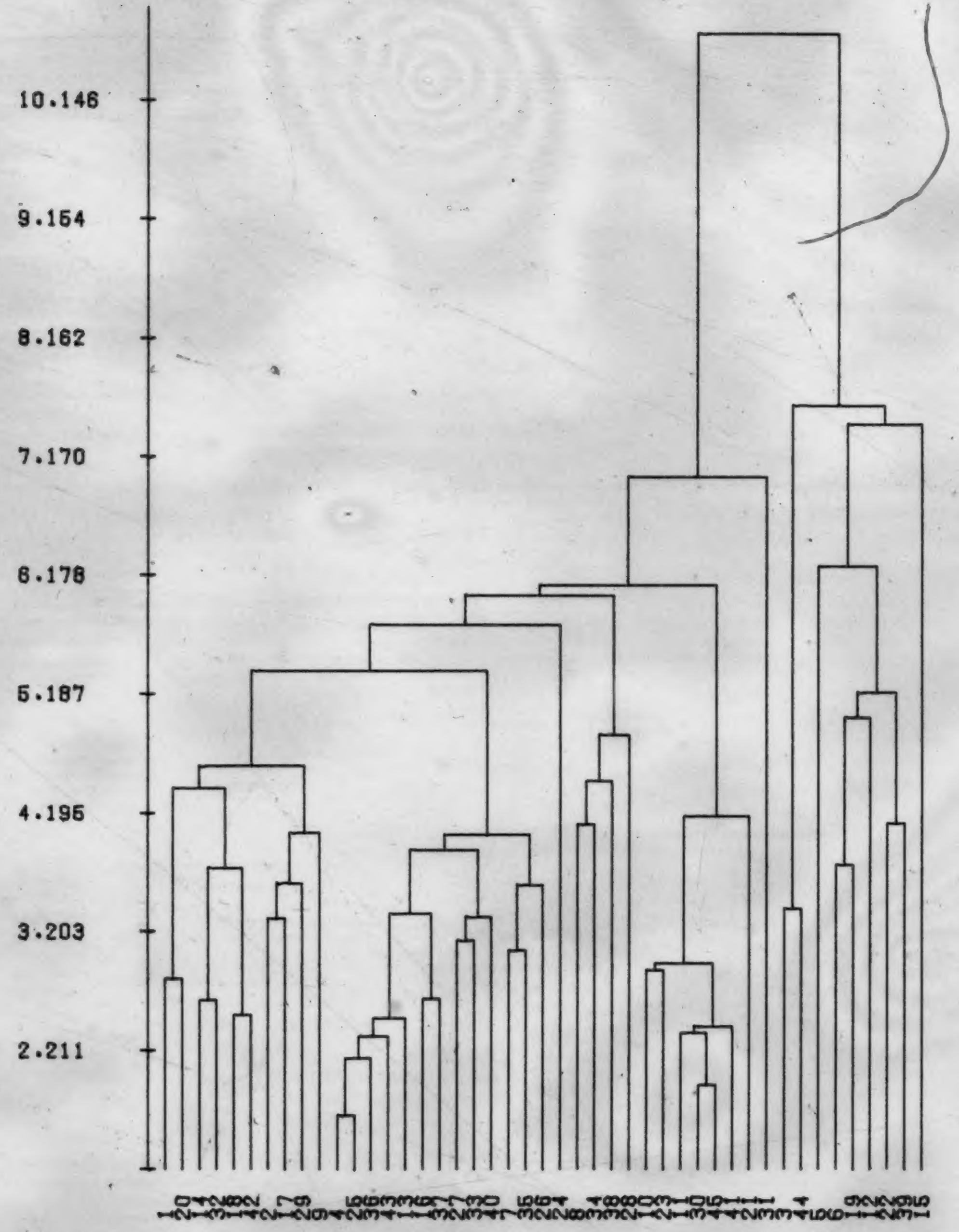
HIERARCHICAL CLUSTERING SOLUTIONS FOR SUBJECT GROUPS



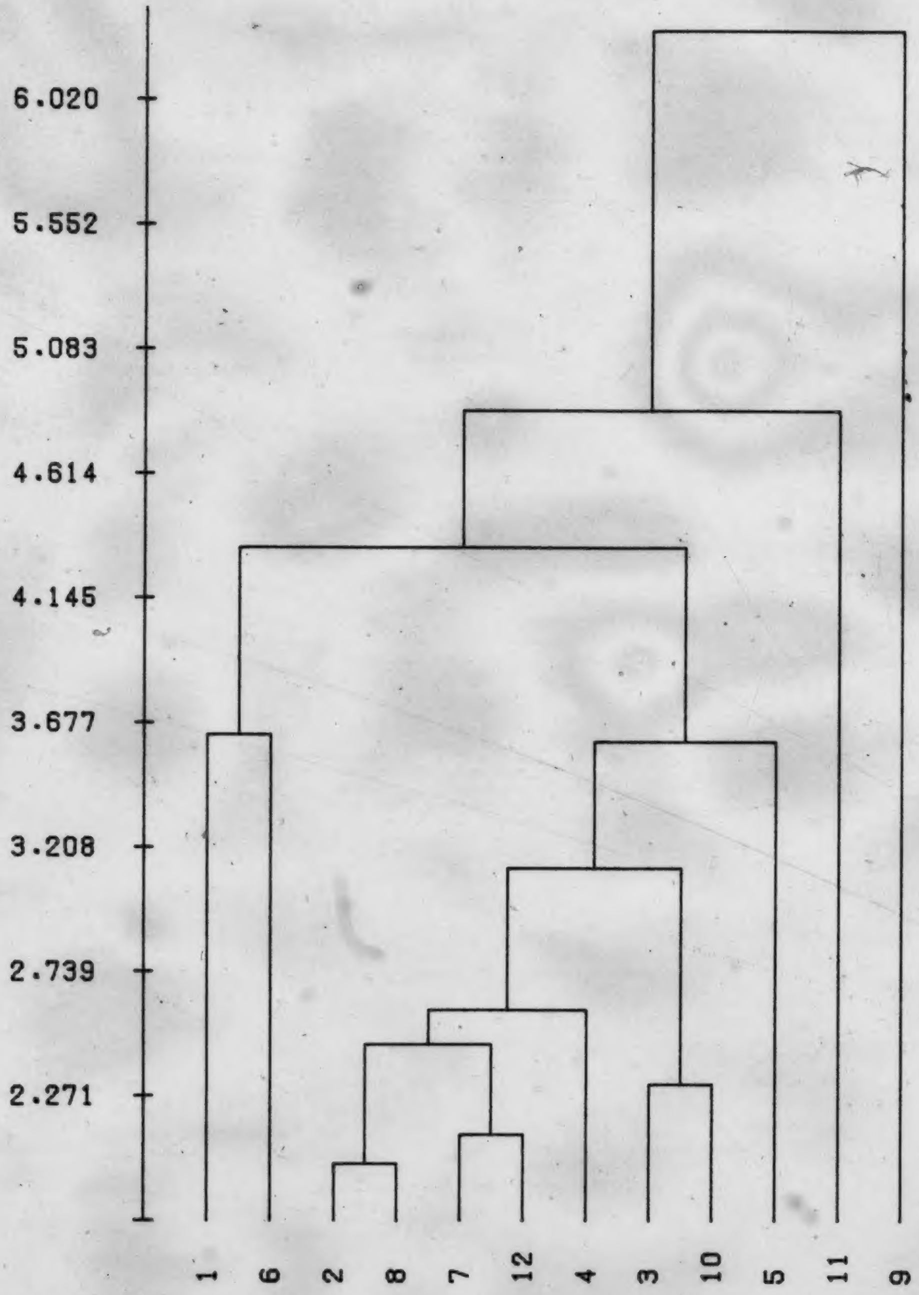
Emotion Terms Subject Clusters - Ratings Task



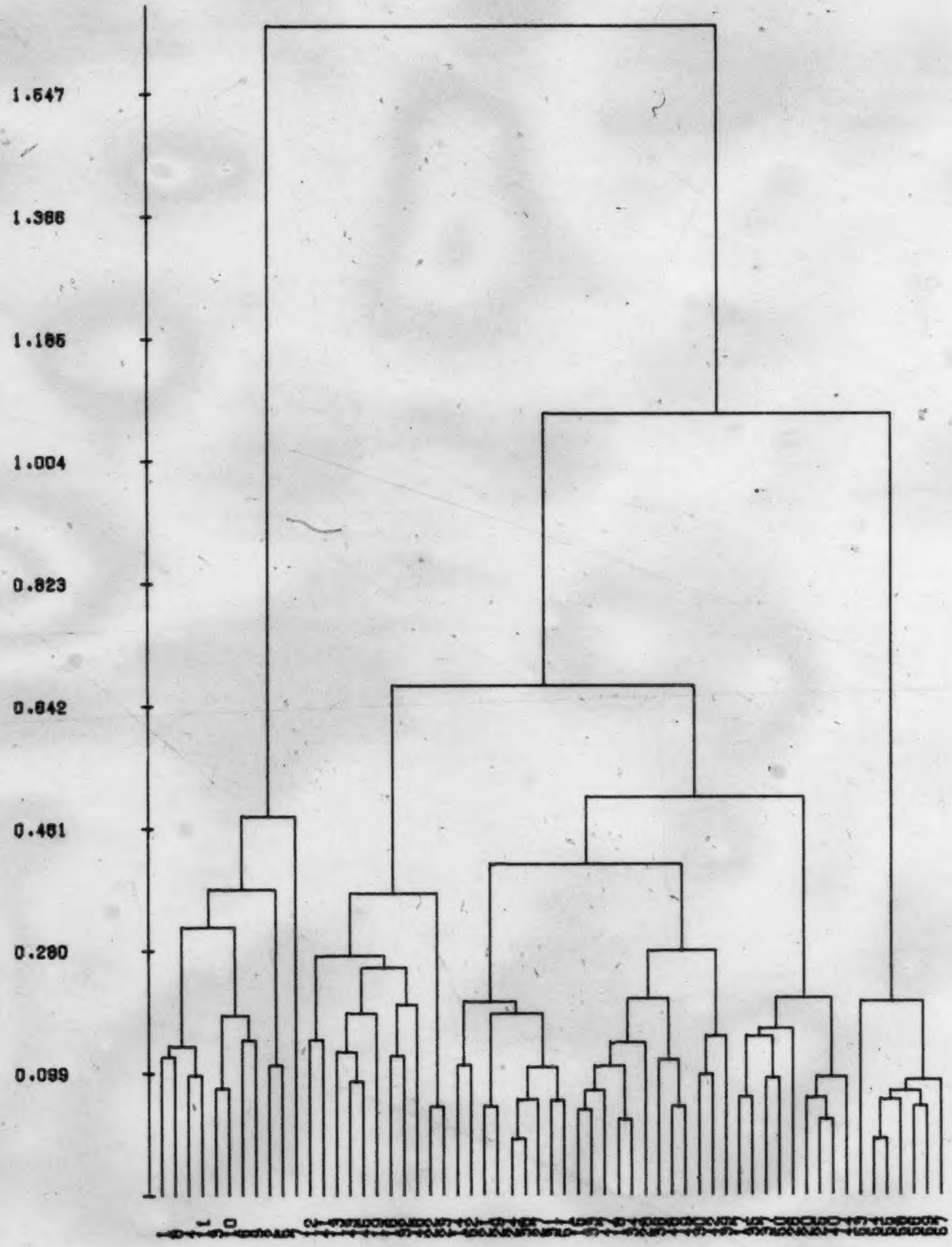
Emotion Terms Subject Clusters - Sorting Task



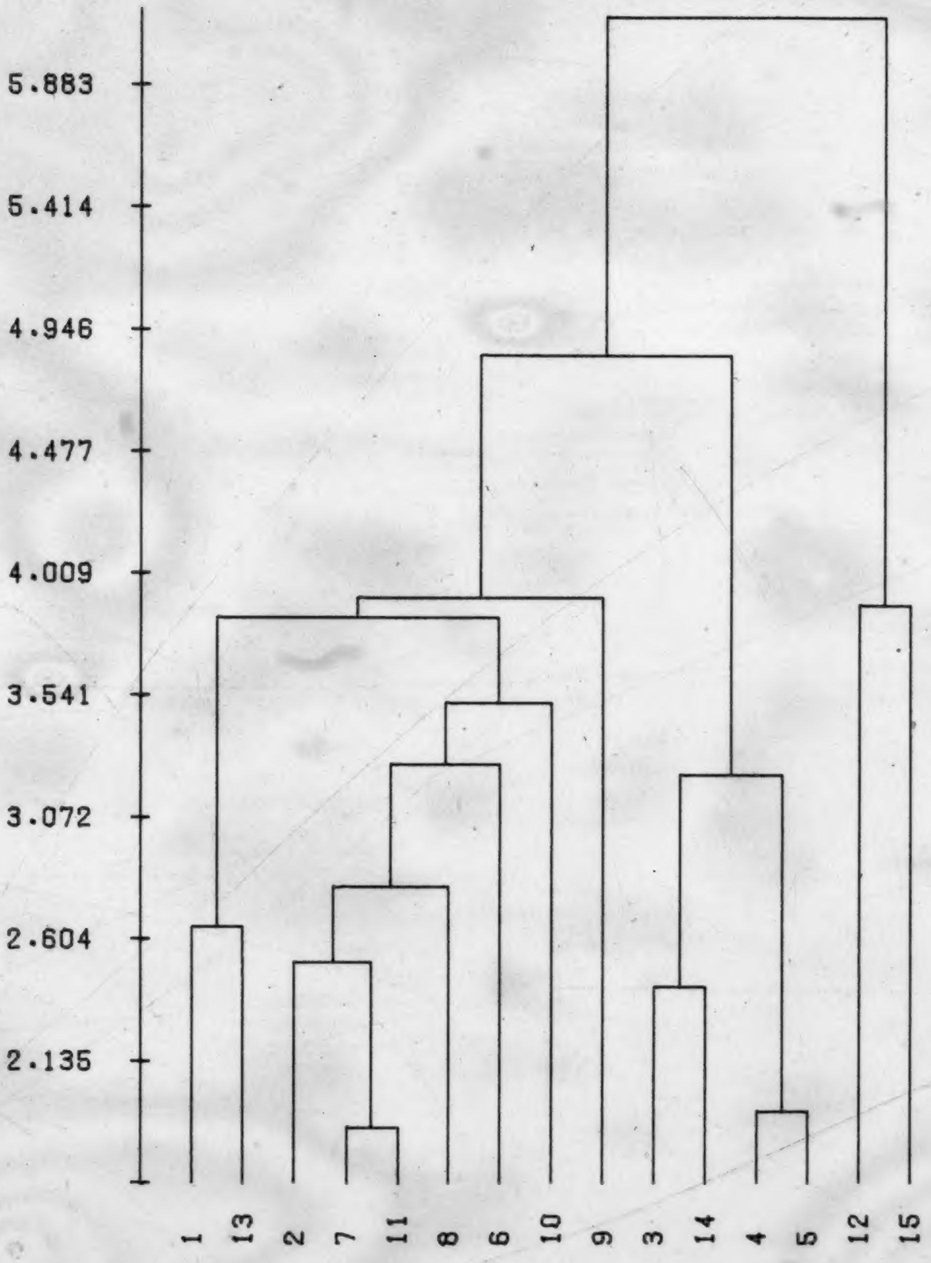
Interpersonal Verbs Subject Clusters - Ratings Task



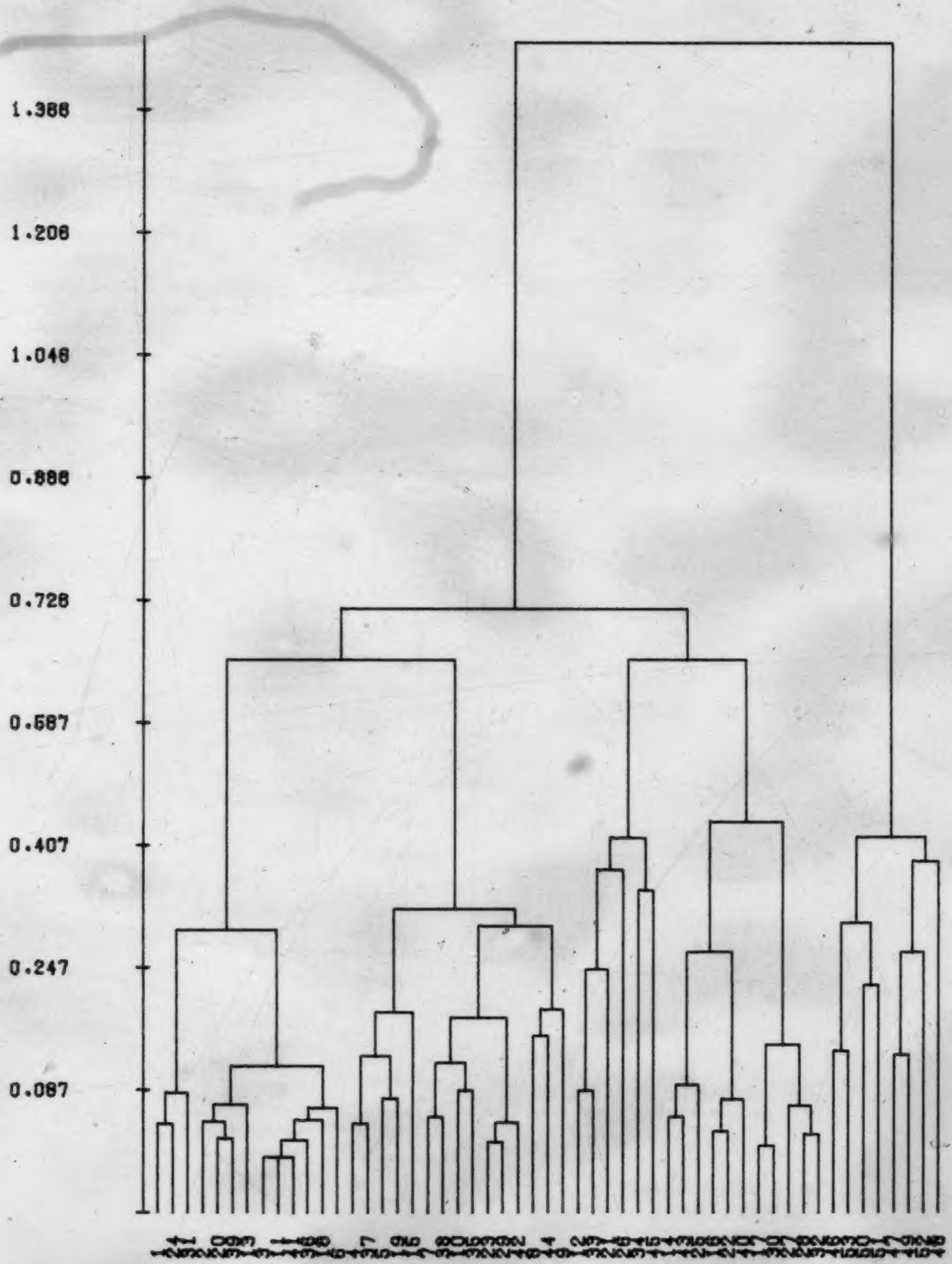
Tools Terms Subject Clusters - Ratings Task



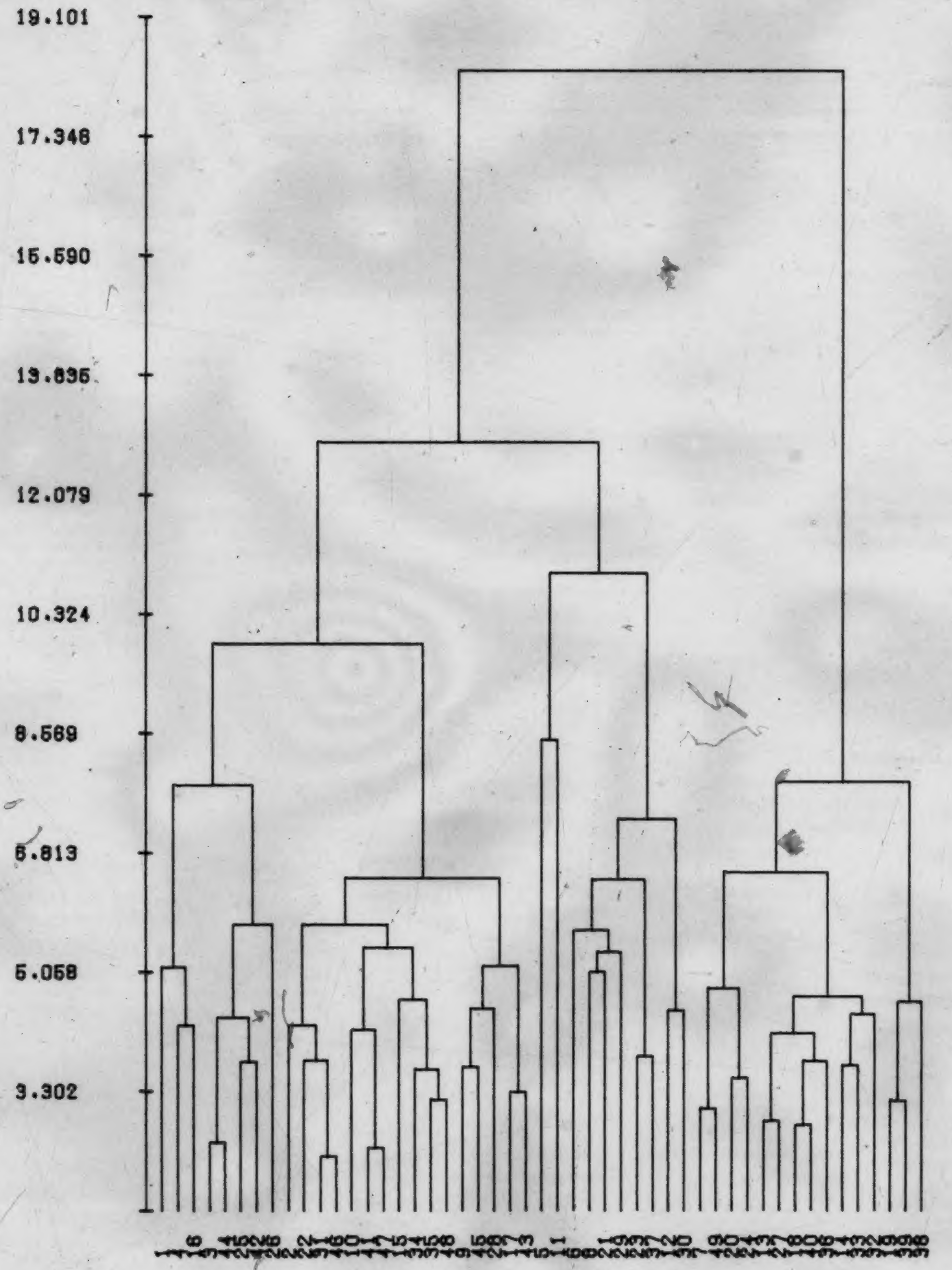
Tools Terms Subject Clusters - Sorting Task



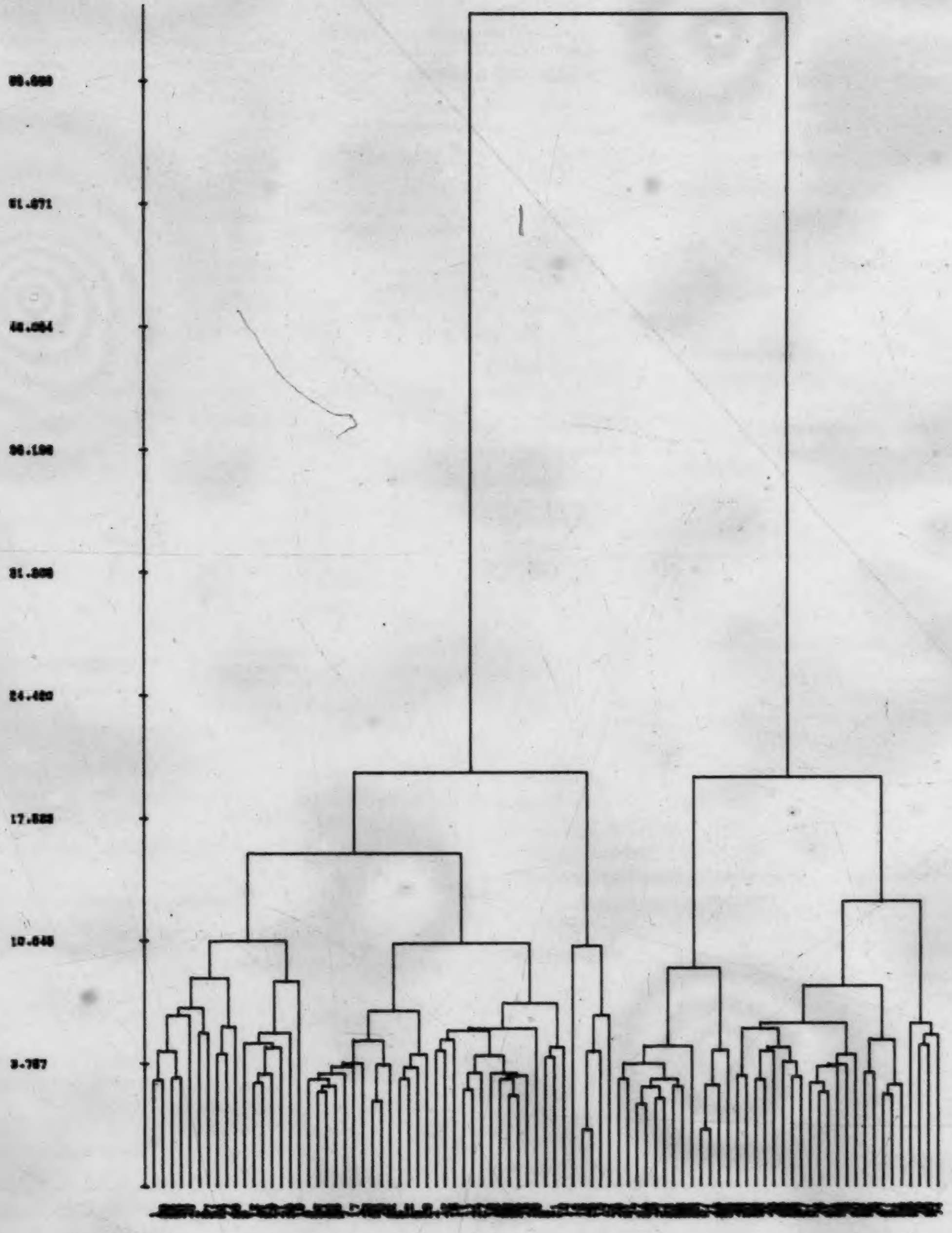
Furniture Terms Subject Clusters - Ratings Task



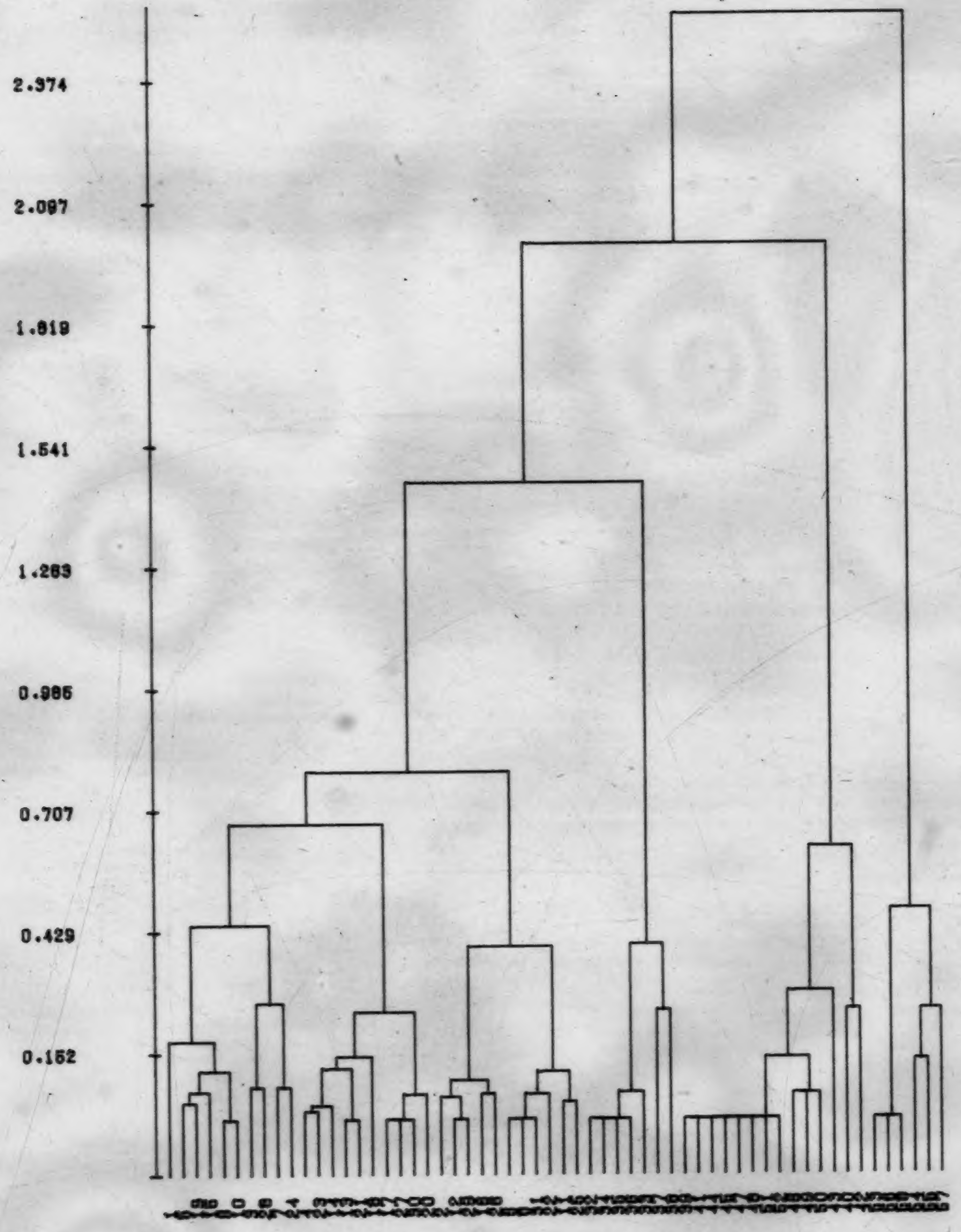
Furniture Terms Subject Clusters - Sorting Task



Pronouns Subject Clusters - Ratings Task



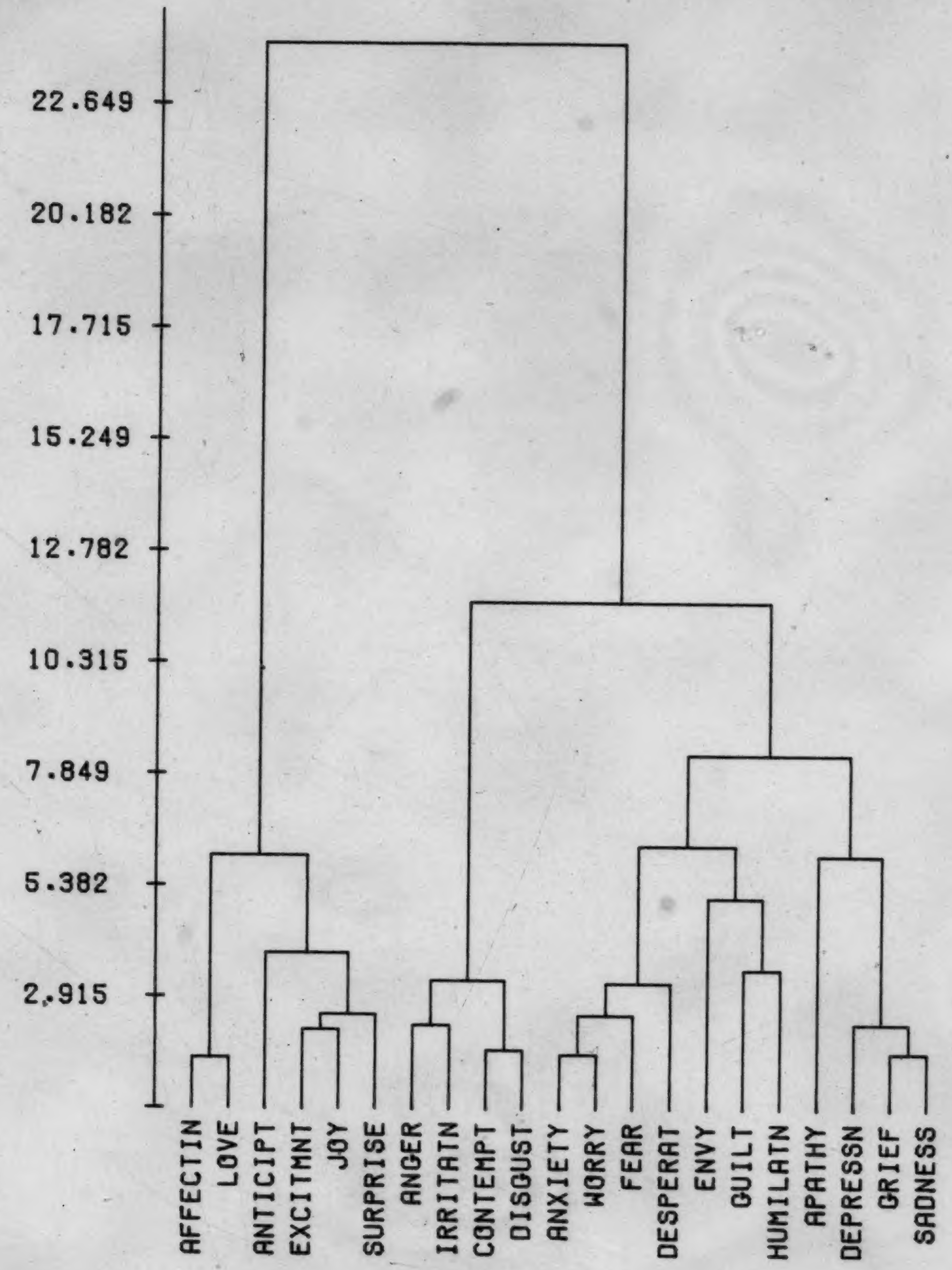
Kinship Terms Subject Clusters - Ratings Task



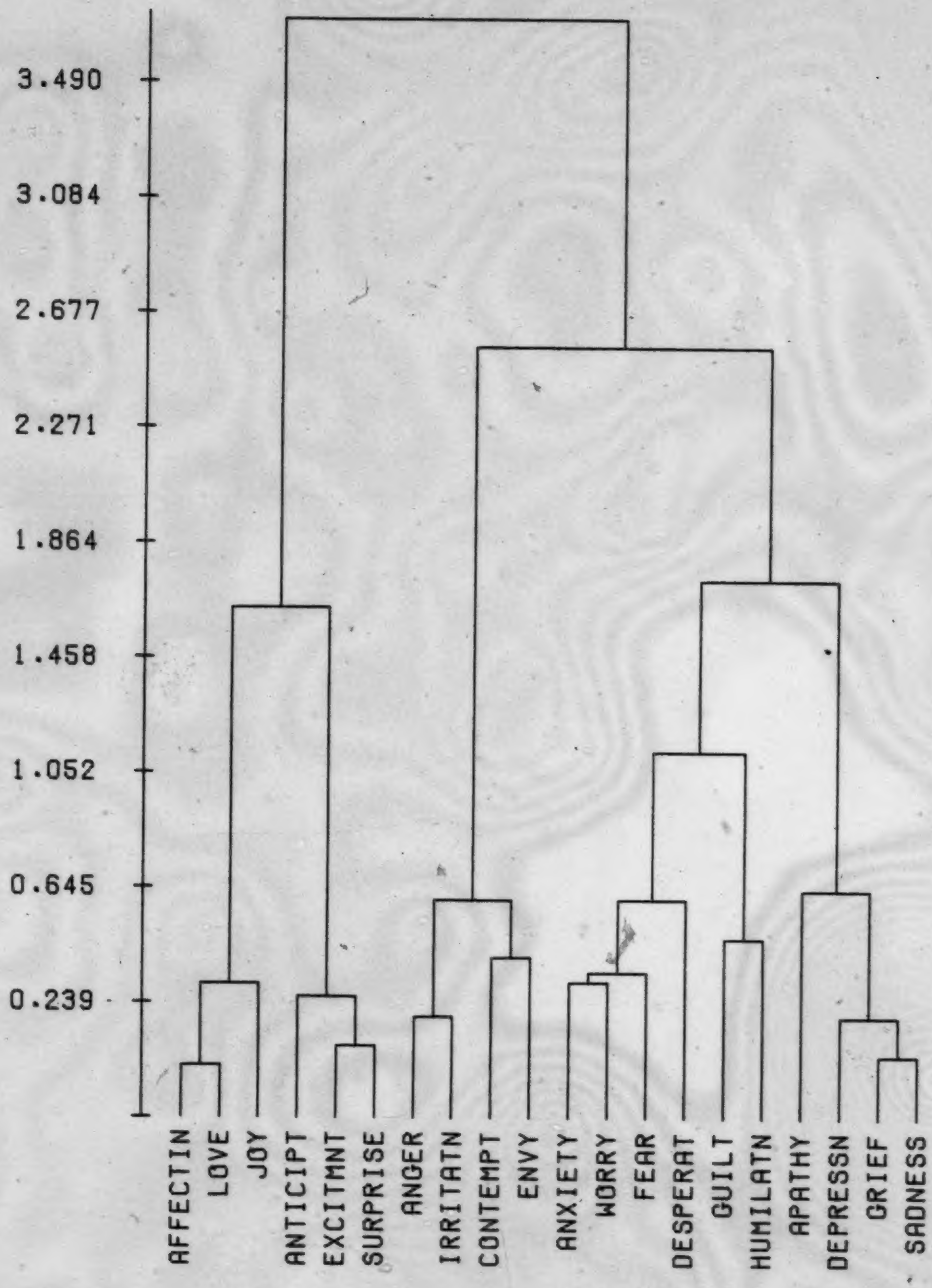
Kinship Terms Subject Clusters - Sorting Task

APPENDIX C

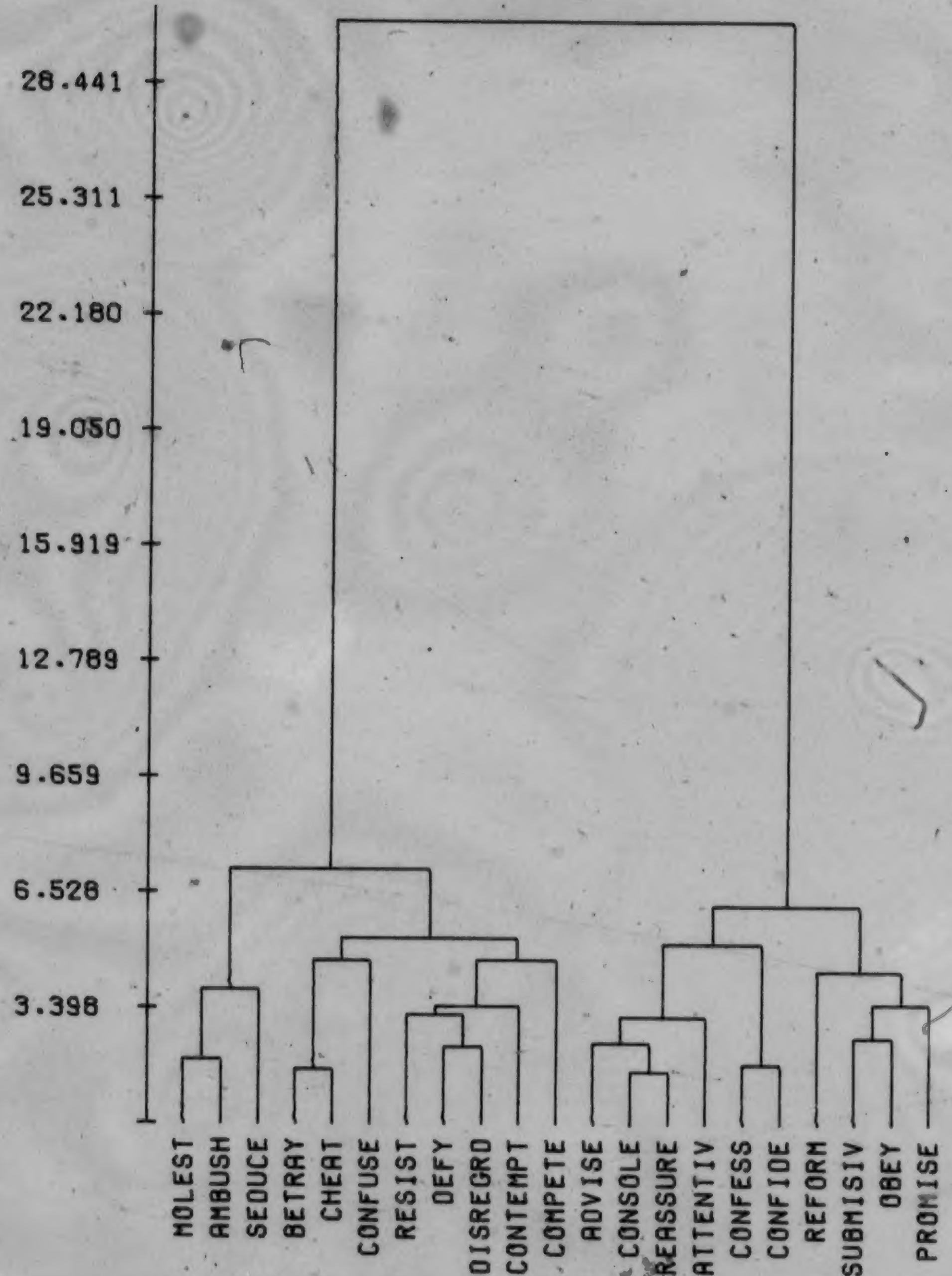
HIERARCHICAL CLUSTERING SOLUTIONS FOR OBJECT CLUSTERS



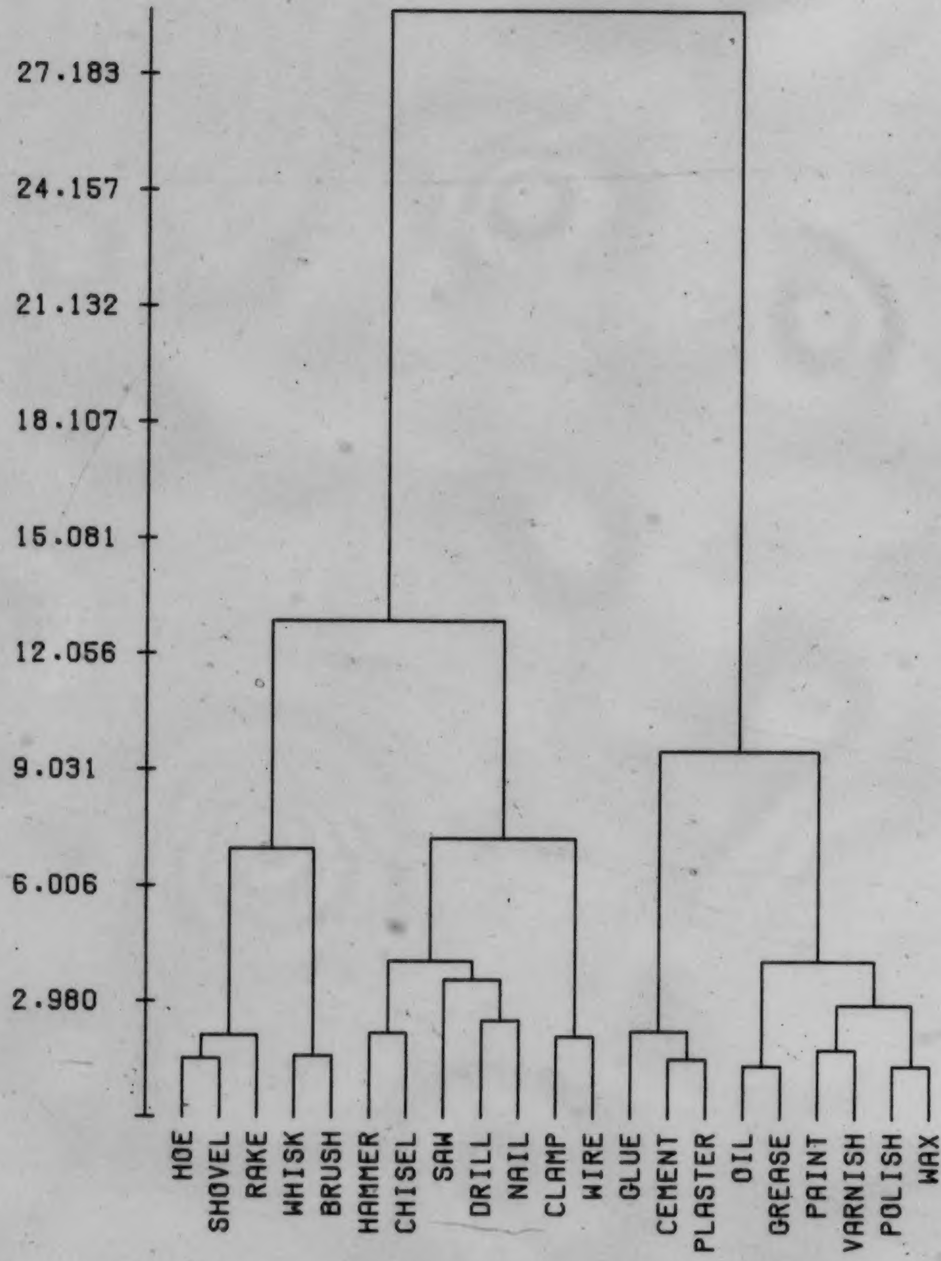
Emotion Terms Clusters - Ratings Subjects



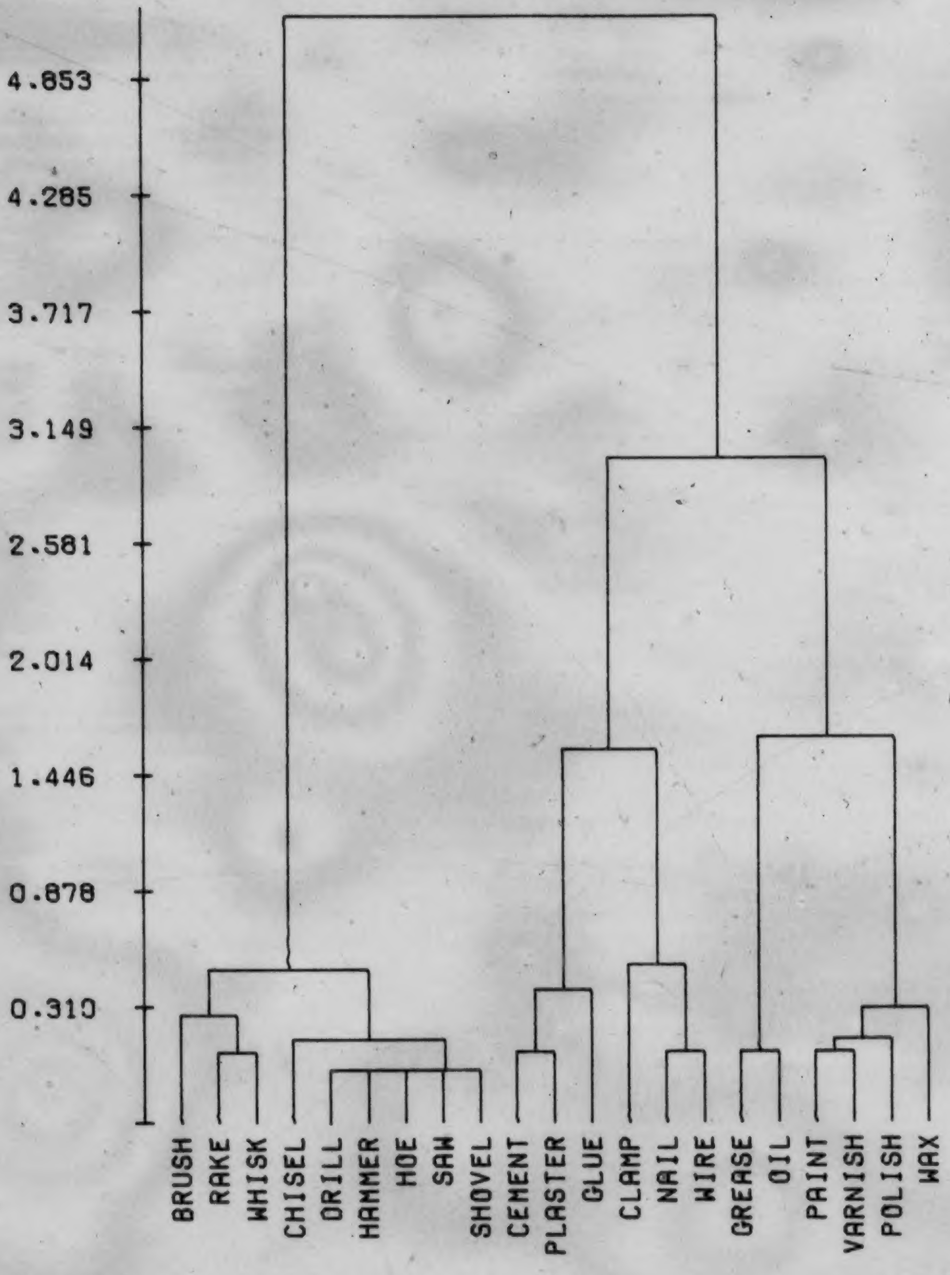
Emotion Terms Clusters - Sorting Subjects



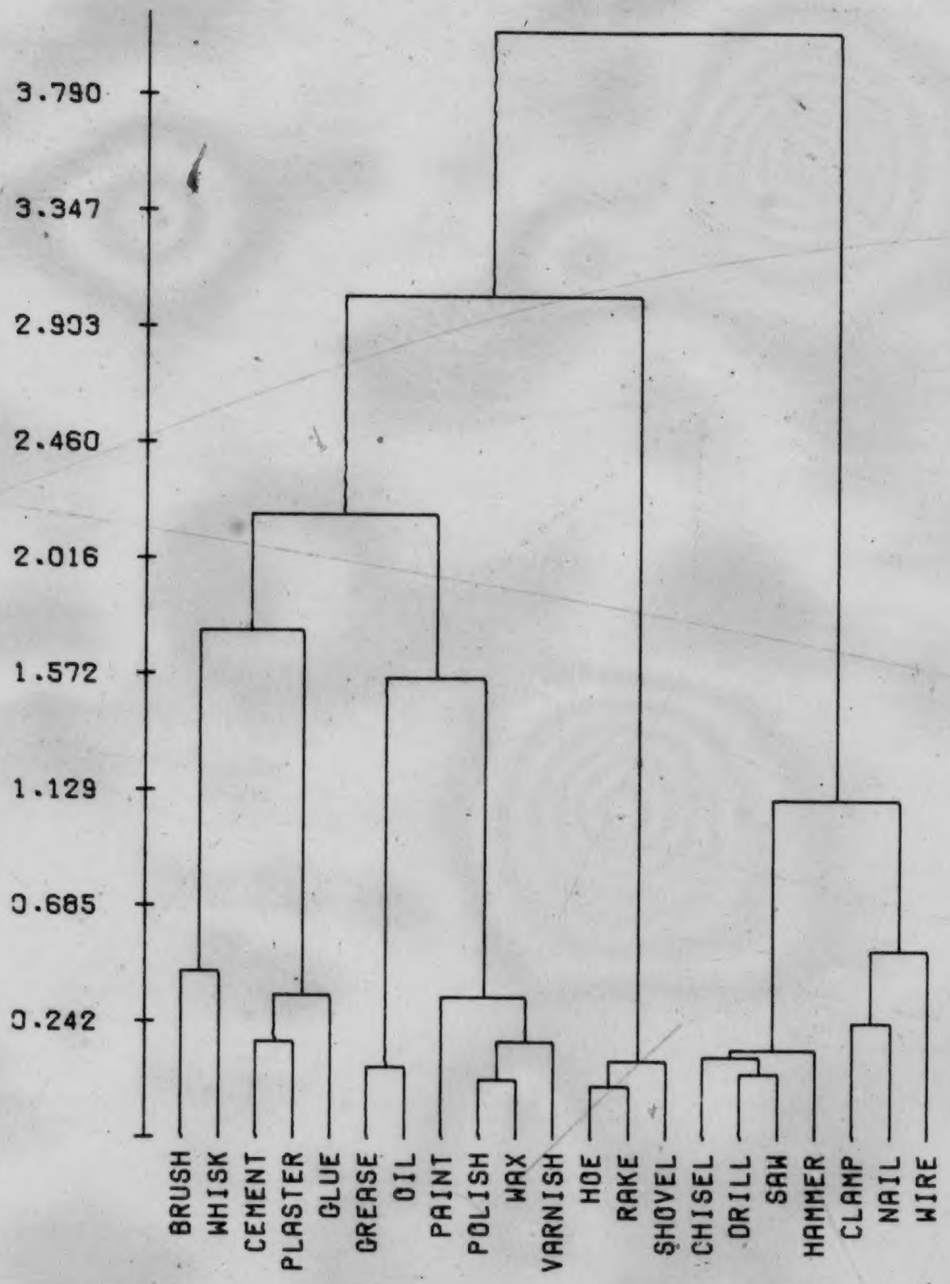
Interpersonal Verbs Clusters - Ratings Subjects



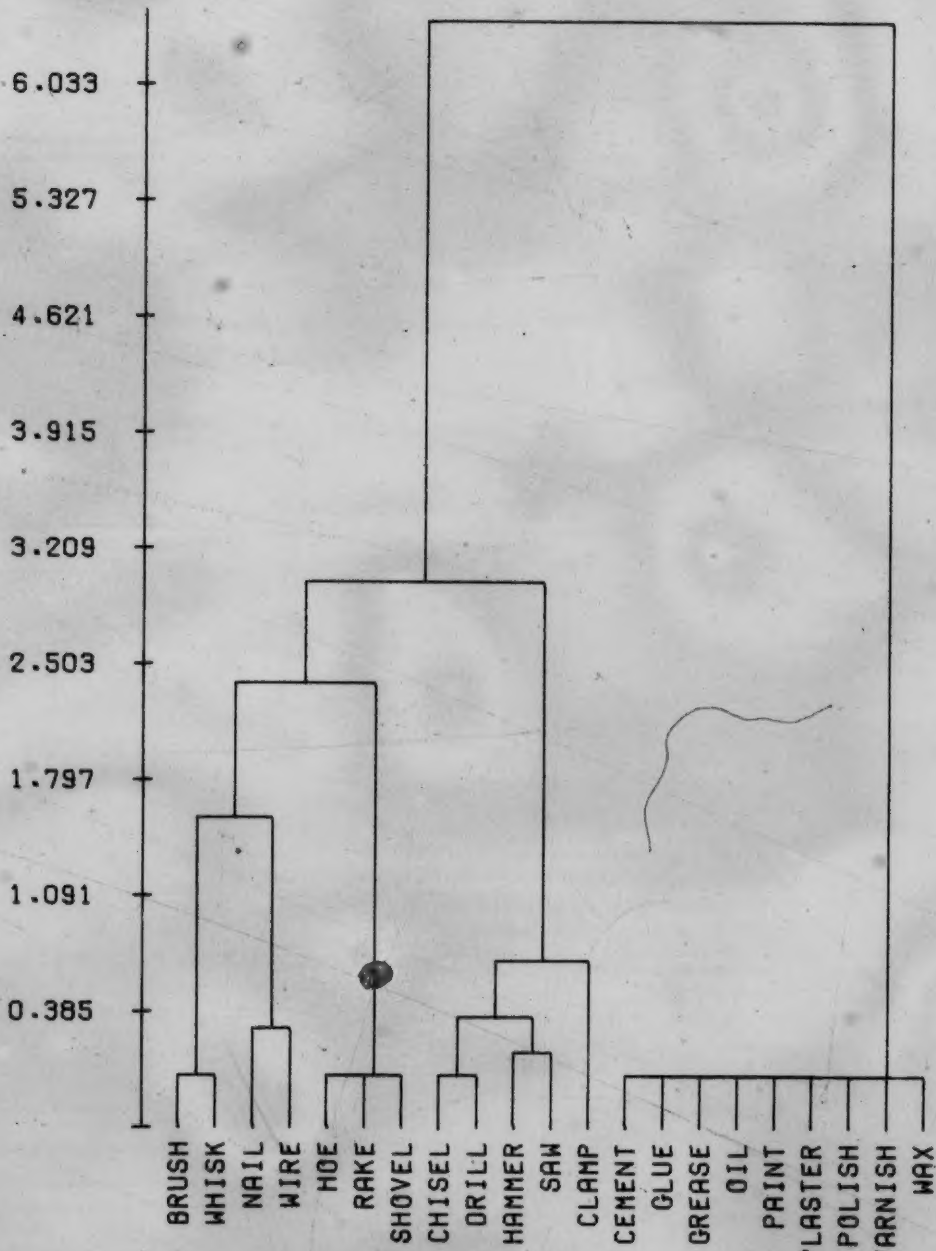
Tools Terms Clusters - Ratings Subjects



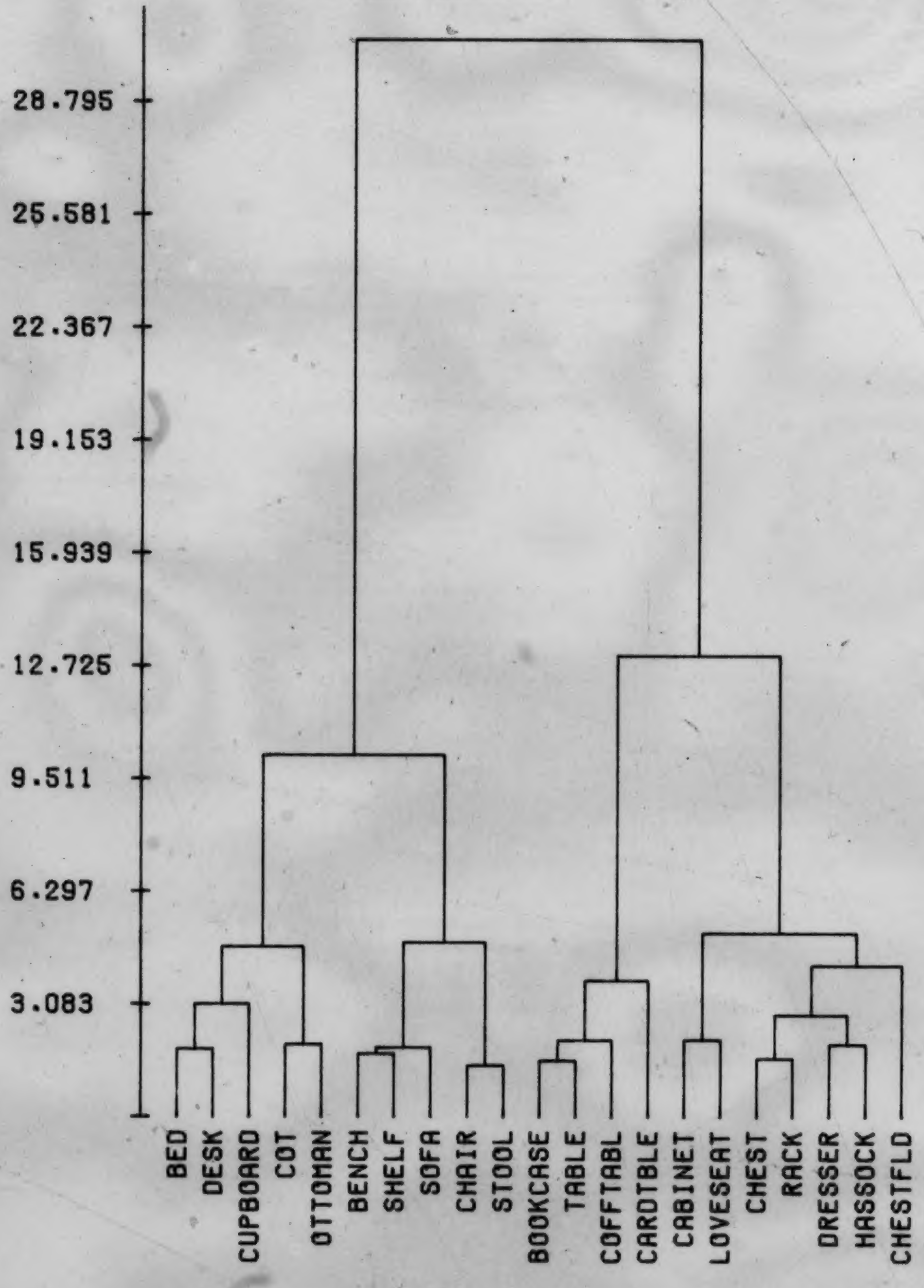
Tools Terms Clusters - Sorting Group 1



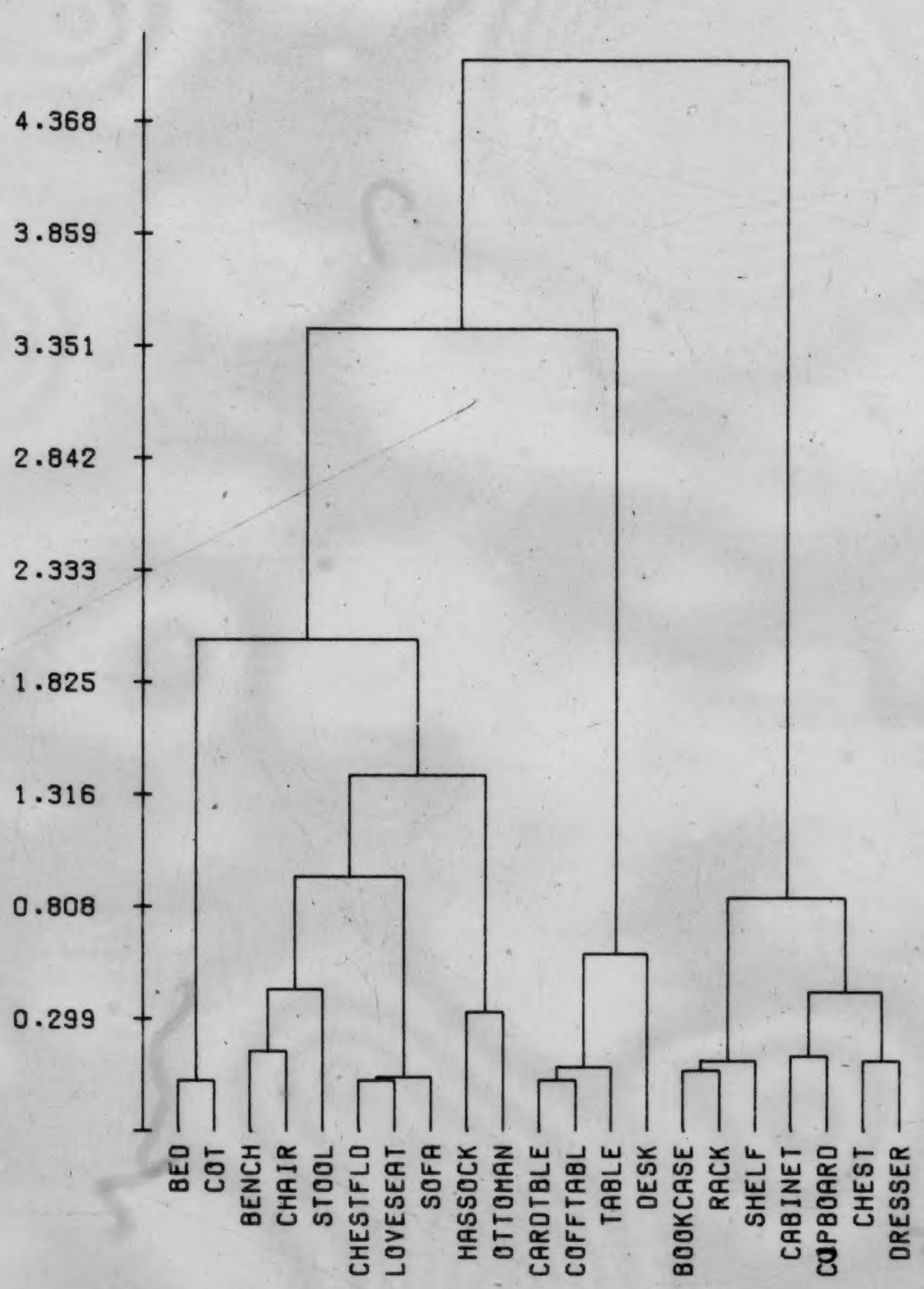
Tools Terms Clusters - Sorting Group 2



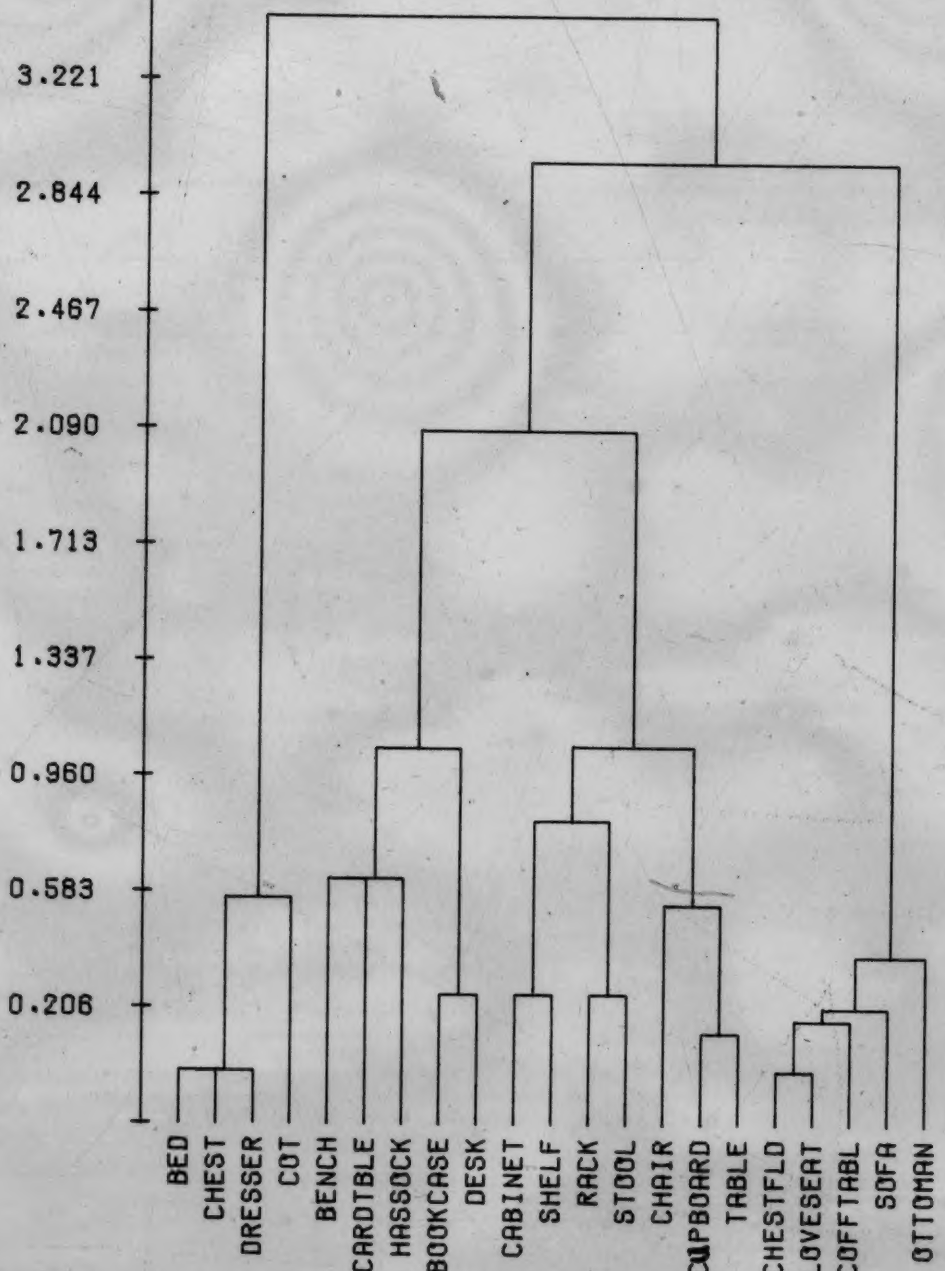
Tools Terms Clusters - Sorting Group 3



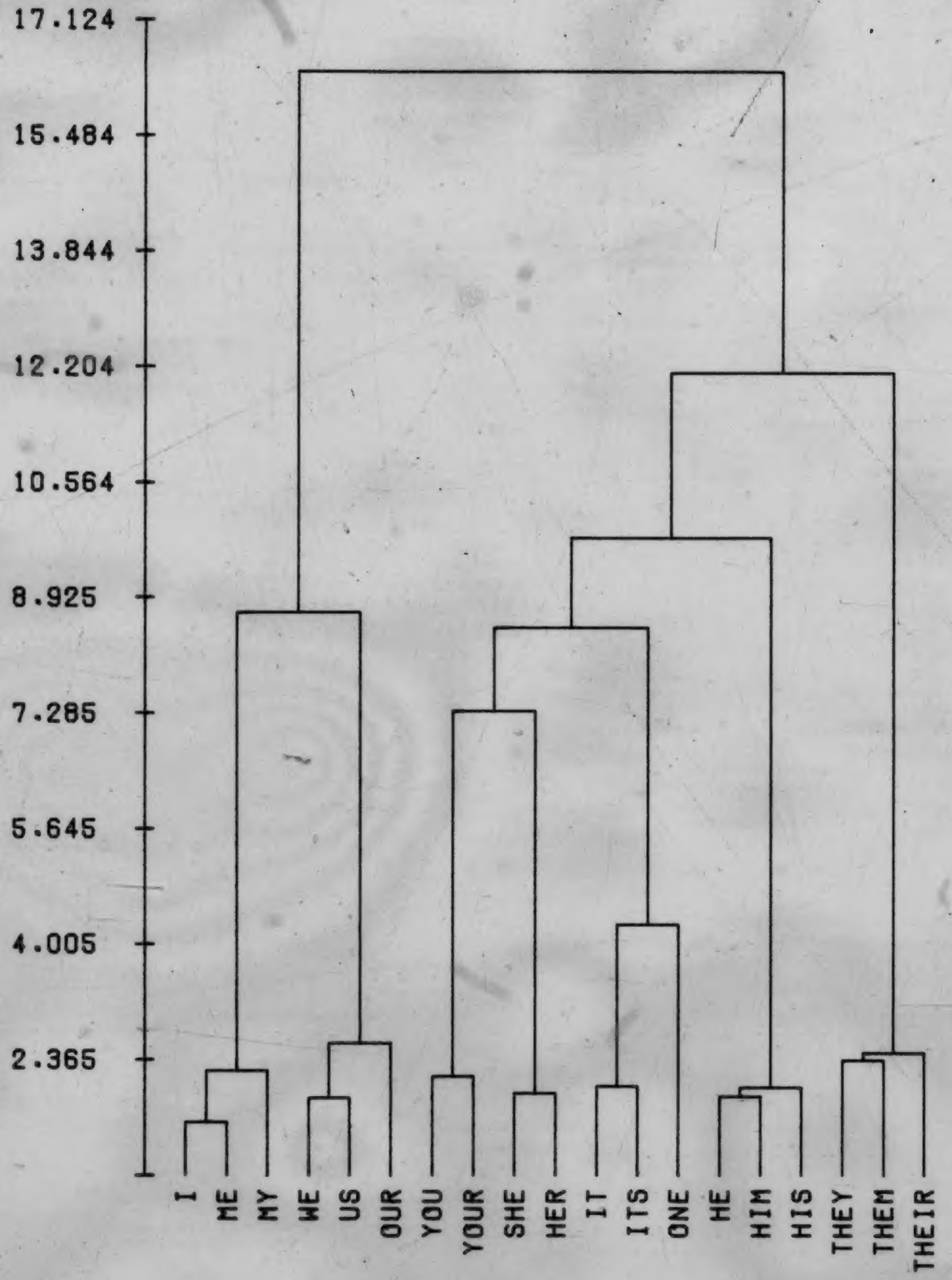
Furniture Terms Clusters - Ratings Subjects



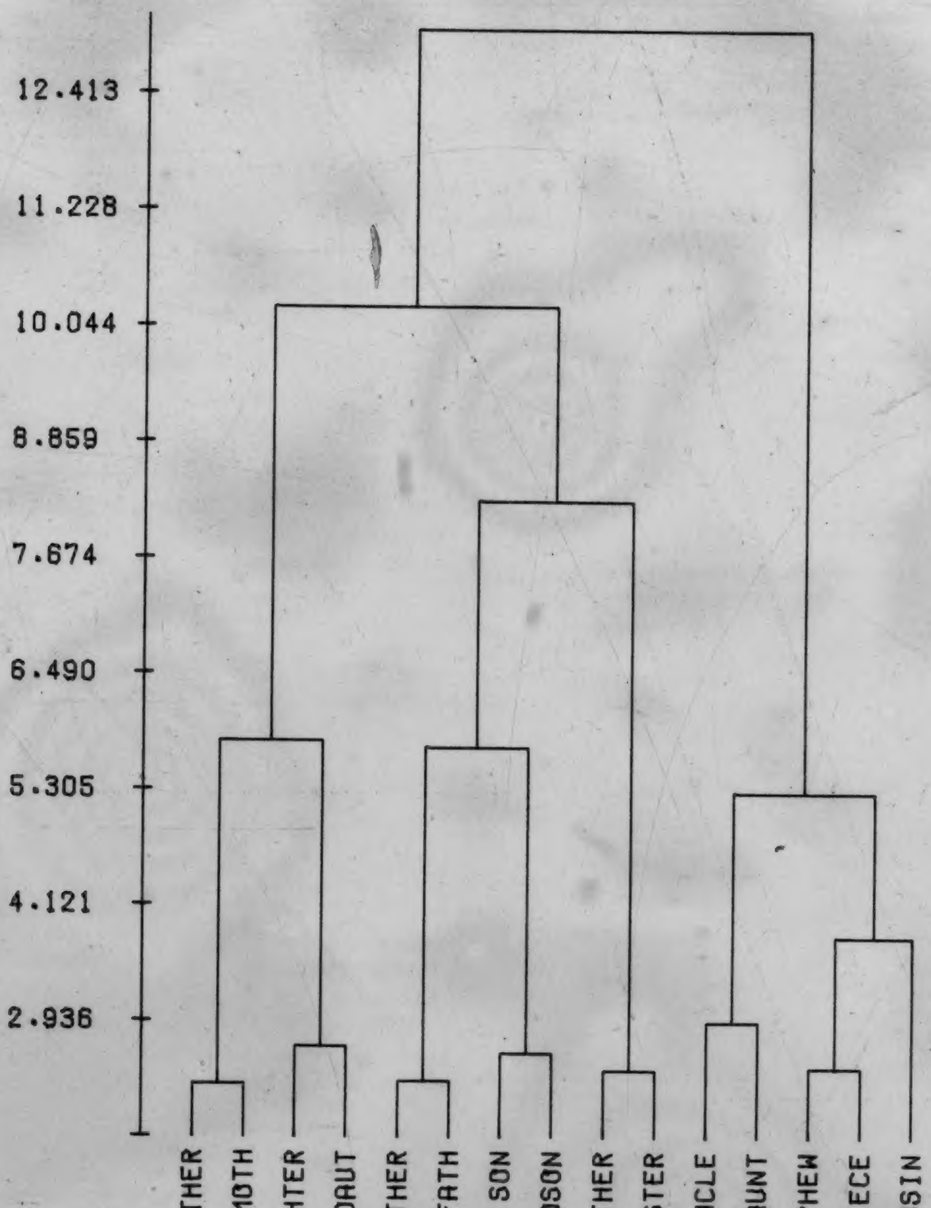
Furniture Terms Clusters - Sorting Group 1



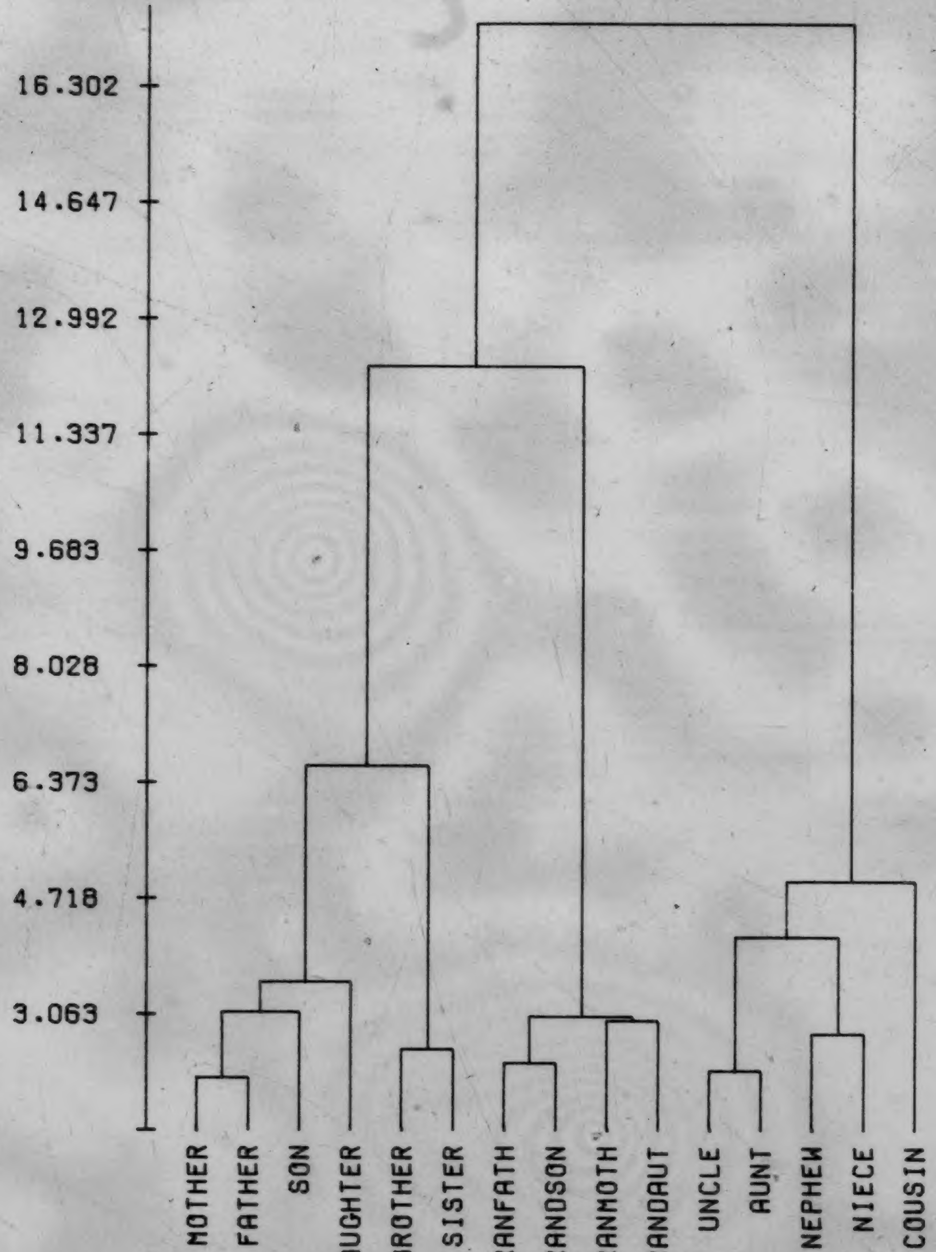
Furniture Terms Clusters - Sorting Group 2



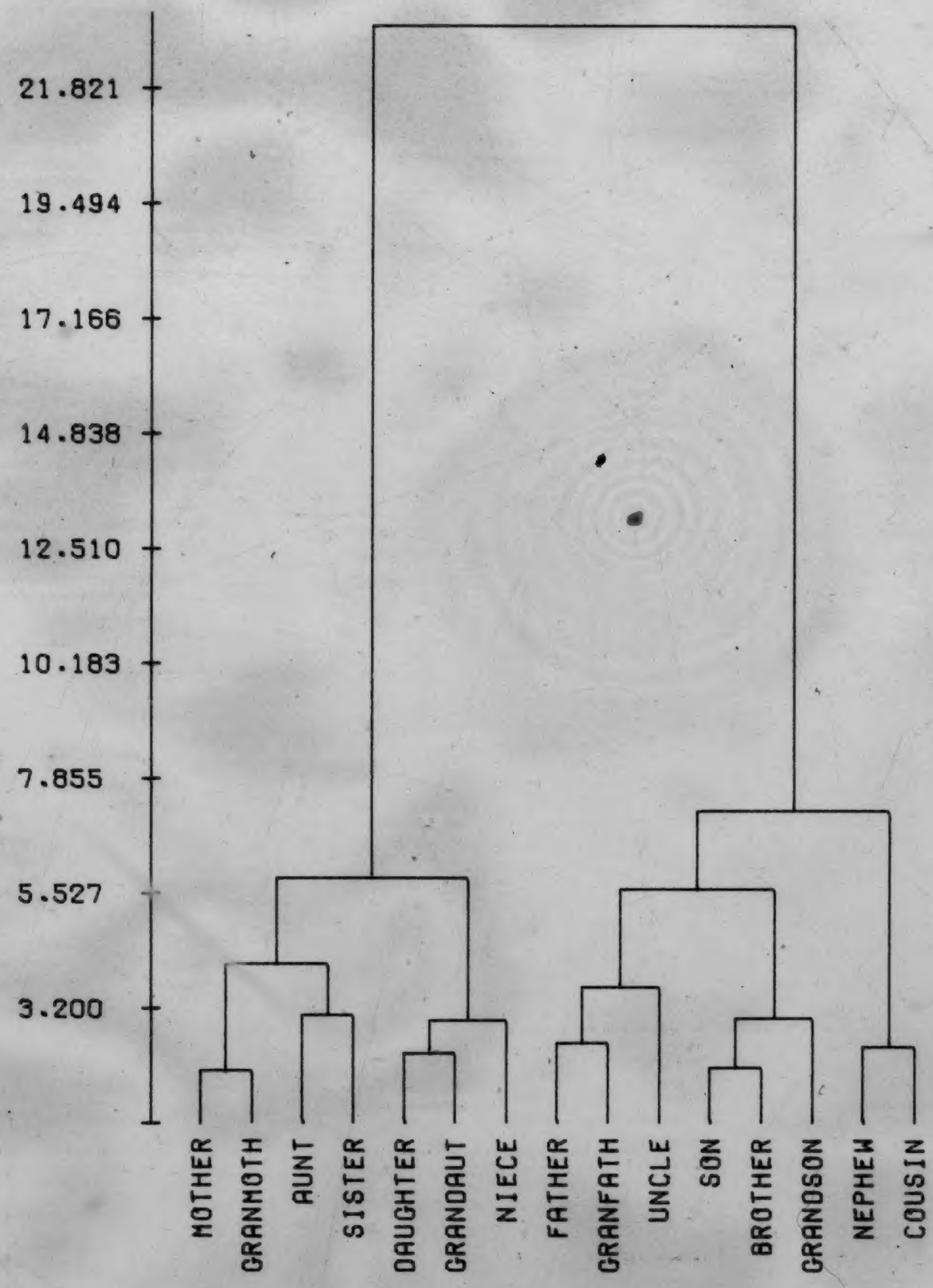
Pronouns Clusters - Ratings Subjects



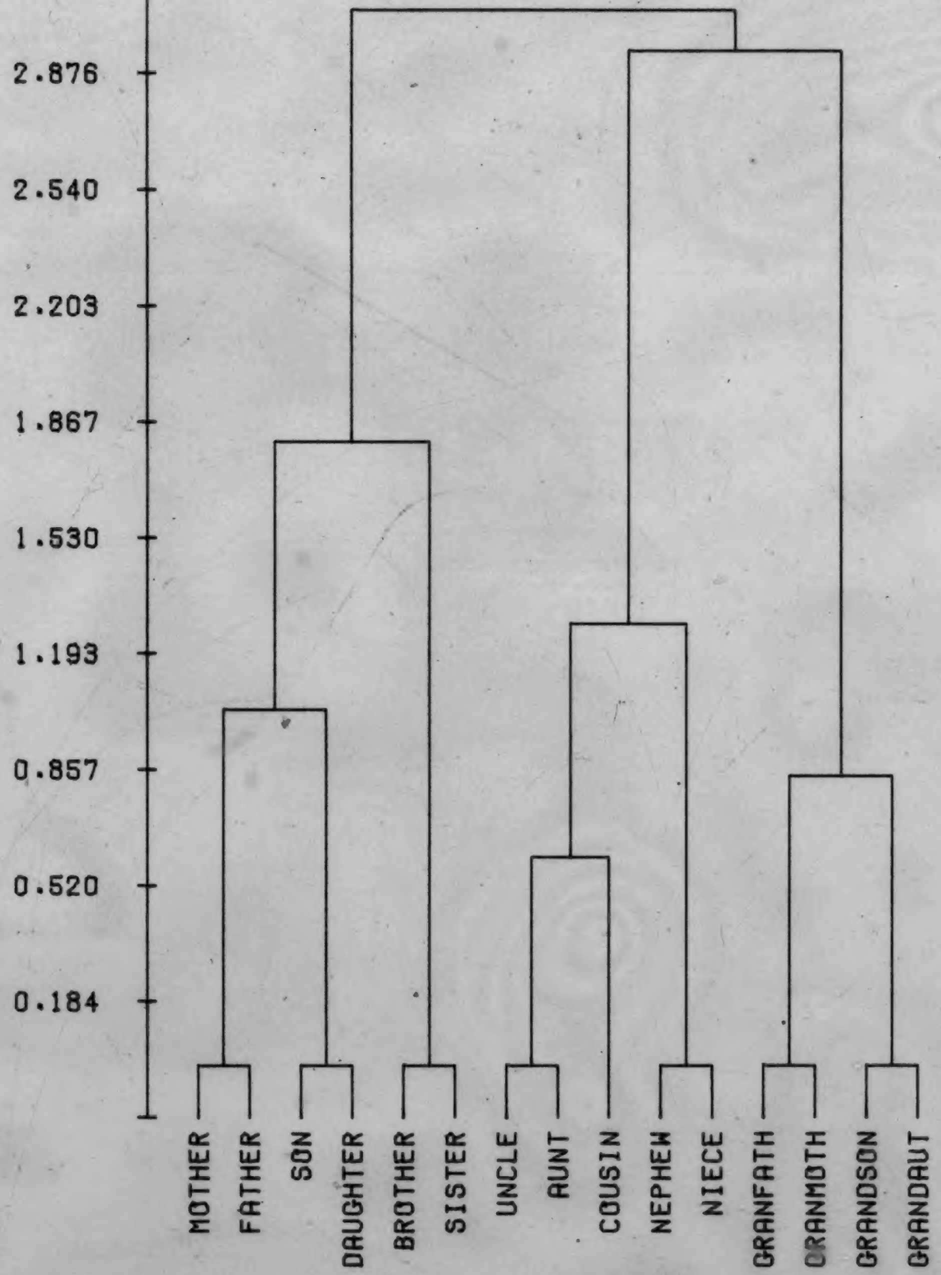
Kinship Terms Clusters - Ratings Group 1



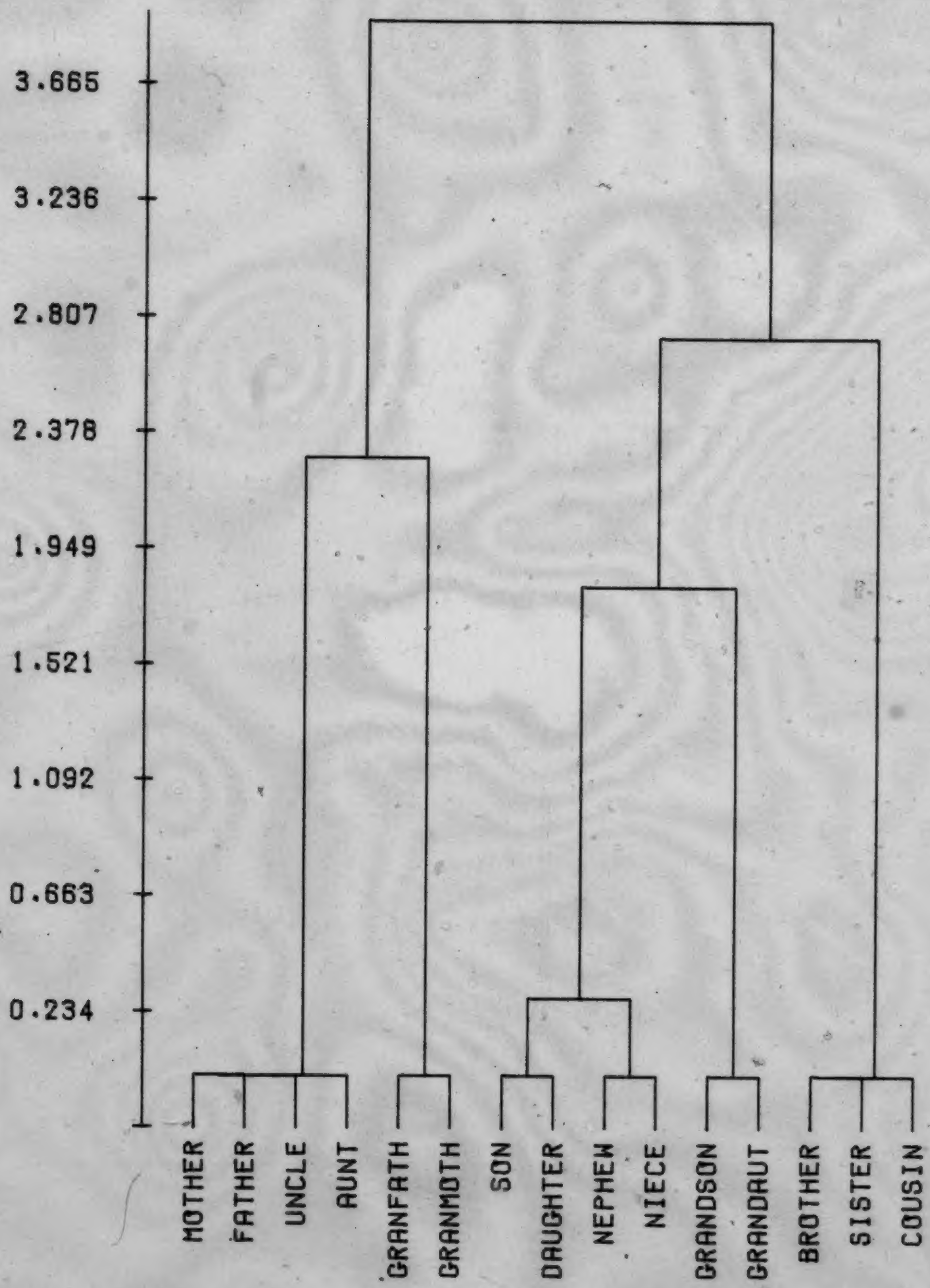
Kinship Terms Clusters - Ratings Group 2



Kinship Terms Clusters - Ratings Group 3



Kinship Terms Clusters - Sorting Group 1



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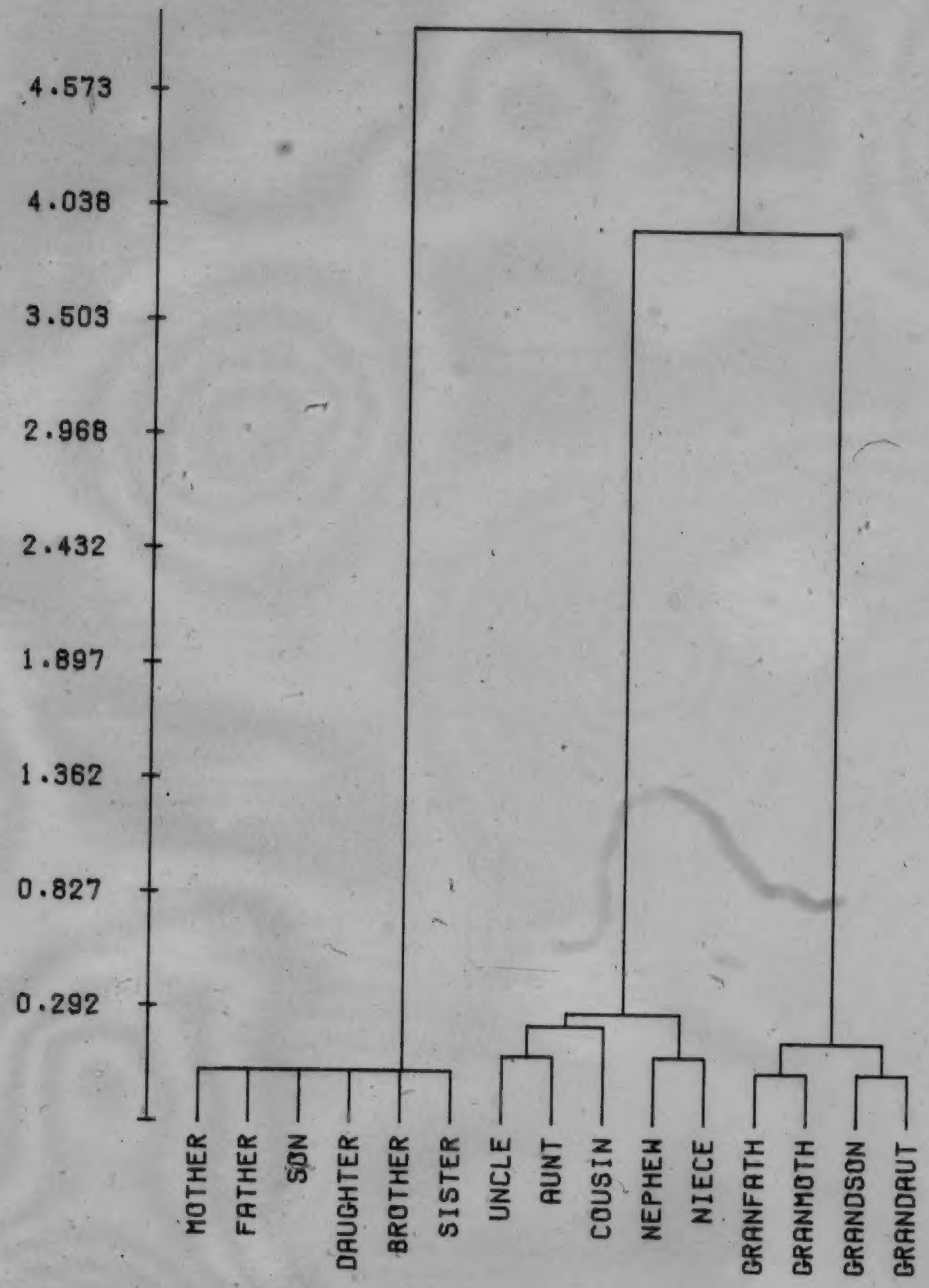
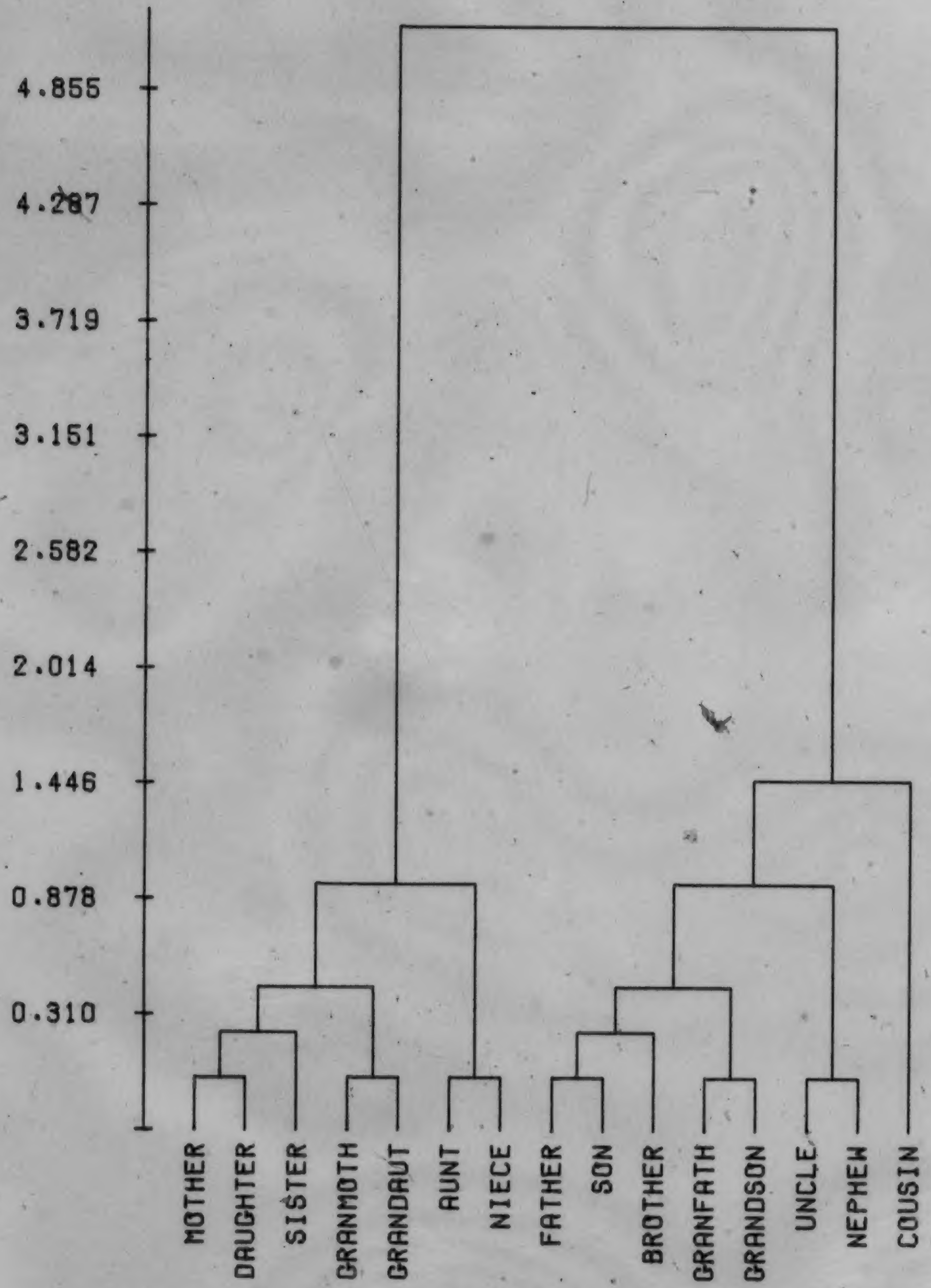


Kinship Terms Clusters - Sorting Group 3



Kinship Terms Clusters - Sorting Group 4

APPENDIX D

POOLED DISTANCE AND STANDARD DEVIATION MATRICES

APPENDIX D1: EMOTION TERMS

SEMANTIC SIMILARITY AVERAGE DISTANCES FOR 40 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 AFFECTION	0.0	6.57	4.57	5.82	6.60	7.13	6.42	6.45	7.05	5.92	3.88	6.42	5.95	6.35	6.25	6.60	2.47	1.57	6.13	4.88	5.67
2 ANGER	6.57	0.0	5.60	4.22	6.42	2.52	5.00	3.95	2.50	4.30	4.35	4.63	4.72	4.42	3.92	2.30	7.25	6.15	5.00	5.67	4.52
3 ANTICIPATION	4.57	5.60	0.0	3.13	6.60	6.27	6.10	5.02	6.40	5.77	2.42	3.85	6.05	5.57	6.20	5.25	3.52	4.32	6.10	4.20	3.80
4 ANXIETY	5.82	4.22	3.13	0.0	6.10	5.02	3.10	2.72	5.32	4.27	4.17	2.20	3.65	3.47	4.07	3.22	6.20	5.30	4.25	5.17	1.65
5 APATHY	6.60	6.42	6.60	6.10	0.0	5.85	3.92	6.07	5.40	6.47	7.38	6.10	5.60	5.72	5.40	6.05	6.60	6.60	4.60	6.95	5.88
6 CONTEMPT	7.13	2.52	6.27	5.02	5.85	0.0	5.17	4.77	1.75	4.07	6.27	4.67	5.55	4.70	4.63	2.95	6.97	7.20	5.15	6.67	5.20
7 DEPRESSION	6.42	5.00	6.10	3.10	3.92	5.17	0.0	3.13	4.72	4.92	7.20	3.80	2.35	3.52	3.72	4.47	7.20	6.32	2.00	6.55	2.63
8 DESPERATION	6.45	3.95	5.02	2.72	6.07	4.77	3.13	0.0	4.88	4.70	5.07	2.92	3.42	3.88	4.25	3.90	6.75	6.02	4.20	6.15	2.88
9 DISGUST	7.05	2.50	6.40	5.32	5.40	1.75	4.72	4.88	0.0	5.22	6.20	5.15	5.22	4.80	4.20	2.63	7.13	7.15	5.07	6.10	5.38
10 ENVY	5.92	4.30	5.77	4.27	6.47	4.07	4.92	4.70	5.22	0.0	6.02	5.02	5.45	4.47	4.95	3.90	6.45	5.55	5.20	6.13	4.72
11 EXCITEMENT	3.88	4.35	2.42	4.17	7.38	6.27	7.20	5.07	6.20	6.02	0.0	4.40	6.45	6.60	6.65	5.20	2.20	3.42	6.88	2.30	5.35
12 FEAR	6.42	4.63	3.85	2.20	6.10	4.67	3.80	2.92	5.15	5.02	4.40	0.0	4.65	3.77	4.38	4.25	6.90	6.30	4.57	5.25	2.40
13 GRIEF	5.95	4.72	6.05	3.65	5.60	5.55	2.35	3.42	5.22	5.45	6.45	4.65	0.0	4.10	4.55	5.15	7.38	5.90	1.70	6.00	3.30
14 GUILT	6.35	4.42	5.57	3.47	5.72	4.70	3.52	3.88	4.80	4.47	6.60	3.77	4.10	0.0	3.52	4.55	7.05	6.17	4.02	6.38	3.27
15 HUMILIATION	6.25	3.92	6.20	4.07	5.40	4.63	3.72	4.25	4.20	4.95	6.65	4.38	4.55	3.52	0.0	3.63	6.92	6.25	3.95	5.92	4.47
16 IRRITATION	6.60	2.30	5.25	3.22	6.05	2.95	4.47	3.90	2.63	3.90	5.20	4.25	5.15	4.55	3.63	0.0	6.92	6.35	4.97	5.77	3.65
17 JOY	2.47	7.25	3.52	6.20	6.60	6.97	7.20	6.75	7.13	6.45	2.20	6.90	7.38	7.05	6.92	6.92	0.0	2.10	7.32	2.60	6.82
18 LOVE	1.57	6.15	4.32	5.30	6.60	7.20	6.32	6.02	7.15	5.55	3.42	6.30	5.90	6.17	6.25	6.35	2.10	0.0	6.00	4.27	5.20
19 SADNESS	6.13	5.00	6.10	4.25	4.60	5.15	2.00	4.20	5.07	5.20	6.88	4.57	1.70	4.02	3.95	4.97	7.32	6.00	0.0	6.22	3.55
20 SURPRISE	4.88	5.67	4.20	5.17	6.95	6.67	6.55	6.15	6.10	6.13	2.30	5.25	6.00	6.38	5.92	5.77	2.60	4.27	6.22	0.0	6.13
21 WORRY	5.67	4.52	3.80	1.65	5.88	5.20	2.63	2.88	5.38	4.72	5.35	2.40	3.30	3.27	4.47	3.65	6.82	5.20	3.55	6.13	0.0

EMOTION TERMS

SEMANTIC SIMILARITY STANDARD DEVIATIONS FOR 40 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 AFFECTION	0.0	1.06	1.41	1.24	0.78	0.88	1.15	1.08	0.75	1.37	1.68	0.81	1.71	0.89	1.21	0.71	1.09	0.64	1.24	1.65	1.16
2 ANGER	1.06	0.0	1.24	1.23	1.36	1.34	1.40	1.60	1.24	1.40	1.87	1.66	1.40	1.48	1.61	1.09	0.63	1.33	1.32	1.37	1.52
3 ANTICIPATION	1.41	1.24	0.0	1.88	1.24	1.20	1.58	1.46	1.08	1.37	1.68	1.92	1.01	1.39	1.14	1.43	1.47	1.61	1.17	2.31	1.74
4 ANXIETY	1.24	1.23	1.88	0.0	1.30	1.62	1.55	1.40	1.44	1.48	2.05	1.22	1.58	1.65	1.80	1.25	1.52	1.70	1.68	1.68	1.00
5 APATHY	0.78	1.36	1.24	1.30	0.0	1.21	2.08	1.53	1.79	0.75	0.90	1.15	1.52	1.38	1.43	1.11	0.98	1.26	1.48	0.78	1.22
6 CONTEMPT	0.88	1.34	1.20	1.62	1.21	0.0	1.45	1.58	0.81	1.91	1.06	1.62	1.32	1.32	1.89	1.24	1.07	1.22	1.39	0.83	1.20
7 DEPRESSION	1.15	1.40	1.58	1.55	2.08	1.45	0.0	1.56	1.48	1.73	0.79	1.45	1.10	1.41	1.41	1.40	0.65	1.23	1.30	0.88	1.08
8 DESPERATION	1.08	1.60	1.46	1.40	1.53	1.58	1.56	0.0	1.47	1.59	1.73	1.56	1.57	1.62	1.60	1.50	1.10	1.58	1.67	1.12	1.32
9 DISGUST	0.75	1.24	1.08	1.44	1.79	0.81	1.48	1.47	0.0	1.76	1.18	1.41	1.46	1.34	1.74	1.13	0.56	1.05	1.46	1.26	1.21
10 ENVY	1.37	1.40	1.37	1.48	0.75	1.91	1.73	1.59	1.76	0.0	1.42	1.66	1.32	1.63	1.58	1.60	1.18	1.54	1.30	1.22	1.30
11 EXCITEMENT	1.68	1.87	1.68	2.05	0.90	1.06	0.79	1.73	1.18	1.42	0.0	1.46	1.26	1.03	0.80	1.73	1.22	1.77	0.65	1.60	1.33
12 FEAR	0.81	1.66	1.92	1.22	1.15	1.62	1.45	1.56	1.41	1.66	1.46	0.0	1.49	1.51	1.35	1.45	1.10	1.16	1.34	1.48	1.35
13 GRIEF	1.71	1.40	1.01	1.58	1.52	1.32	1.10	1.57	1.46	1.32	1.26	1.49	0.0	1.52	1.69	1.29	0.87	1.72	1.16	1.40	1.40
14 GUILT	0.89	1.48	1.39	1.65	1.38	1.32	1.41	1.62	1.34	1.63	1.03	1.51	1.52	0.0	1.36	1.45	0.60	1.41	1.75	0.98	1.41
15 HUMILIATION	1.21	1.61	1.14	1.80	1.43	1.89	1.41	1.60	1.74	1.58	0.80	1.35	1.69	1.36	0.0	1.58	0.69	1.19	1.30	1.42	1.58
16 IRRITATION	0.71	1.09	1.43	1.25	1.11	1.24	1.40	1.50	1.13	1.60	1.73	1.45	1.29	1.45	1.58	0.0	0.57	0.89	1.51	1.25	1.56
17 JOY	1.09	0.63	1.47	1.52	0.98	1.07	0.65	1.10	0.56	1.18	1.22	1.10	0.87	0.60	0.69	0.57	0.0	1.48	0.73	1.15	0.64
18 LOVE	0.64	1.33	1.61	1.70	1.26	1.22	1.23	1.58	1.05	1.54	1.77	1.16	1.72	1.41	1.19	0.89	1.48	0.0	1.43	1.38	1.45
19 SADNESS	1.24	1.32	1.17	1.68	1.48	1.39	1.30	1.67	1.46	1.30	0.65	1.34	1.16	1.75	1.30	1.51	0.73	1.43	0.0	0.92	1.26
20 SURPRISE	1.65	1.37	2.31	1.68	0.78	0.83	0.88	1.12	1.26	1.22	1.60	1.48	1.40	0.98	1.42	1.25	1.15	1.38	0.92	0.0	0.99
21 WORRY	1.16	1.52	1.74	1.00	1.22	1.20	1.08	1.32	1.21	1.30	1.33	1.35	1.40	1.41	1.58	1.56	0.64	1.45	1.26	0.99	0.0

EMOTION TERMS

SORTING DISTANCES FOR 58 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2 ANGER	1.00																		
3 ANTICIPATION	.776	1.00																	
4 ANXIETY	.983	.931	.724																
5 APATHY	.931	.914	.966	.776															
6 CONTEMPT	.948	.328	.931	.931	.914														
7 DEPRESSION	1.00	.948	.983	.724	.431	.966													
8 DESPERATION	1.00	.793	.897	.466	.741	.862	.569												
9 ENVY	.914	.517	.879	.931	.897	.397	.931	.879											
10 EXCITEMENT	.655	1.00	.190	.845	.966	.966	.983	.914	.948										
11 FEAR	1.00	.828	.862	.345	.845	.931	.828	.517	.914	.914									
12 GRIEF	.983	.897	.983	.759	.483	.948	.172	.569	.948	1.00	.759								
13 GUILT	1.00	.845	.914	.672	.759	.793	.621	.707	.776	.966	.638	.707							
14 HUMILATION	1.00	.724	.931	.776	.724	.759	.690	.638	.724	1.00	.741	.724	.466						
15 IRRITATION	1.00	.190	.966	.810	.862	.379	.897	.707	.569	.966	.810	.914	.897	.690					
16 JOY	.241	1.00	.621	.966	.966	.931	1.00	1.00	.914	.483	1.00	1.00	1.00	.983	1.00				
17 LOVE	.017	1.00	.793	.983	.931	.931	1.00	1.00	.914	.672	1.00	.983	1.00	1.00	1.00	.224			
18 SADNESS	1.00	.914	.983	.759	.483	.948	.138	.586	.966	1.00	.793	.052	.672	.724	.914	.983	1.00		
19 SURPRISE	.690	1.00	.241	.828	.966	.966	1.00	.914	.948	.086	.879	1.00	.983	.983	.966	.500	.707	.983	
20 WORRY	1.00	.862	.845	.310	.776	.897	.638	.552	.862	.931	.328	.621	.586	.810	.828	1.00	1.00	.638	.914

APPENDIX D2: INTERPERSONAL VERBS

SEMANTIC SIMILARITY AVERAGE DISTANCES FOR 45 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 MOLEST	0.0	2.02	3.27	4.04	3.18	5.13	3.73	4.76	3.60	6.80	7.22	6.27	6.89	5.98	6.44	6.71	6.84	6.56	4.02	4.98	6.49
2 AMBUSH	2.02	0.0	2.67	3.04	3.71	4.80	3.36	4.16	3.73	6.49	6.96	5.98	6.58	5.78	6.16	6.62	6.71	6.47	4.18	4.24	6.56
3 BETRAY	3.27	2.67	0.0	1.76	3.96	4.13	2.89	4.38	3.00	6.29	6.76	5.82	6.91	5.91	6.11	5.89	6.60	7.00	3.20	3.73	7.04
4 CHEAT	4.04	3.04	1.76	0.0	4.44	4.51	2.47	4.02	3.27	6.24	6.58	6.31	6.62	5.64	5.93	6.51	6.60	6.73	3.53	4.22	6.73
5 SEDUCE	3.18	3.71	3.96	4.44	0.0	5.38	4.78	4.78	4.76	5.16	5.11	5.51	4.40	4.71	4.58	5.73	5.20	5.29	5.38	4.53	5.16
6 RESIST	5.13	4.80	4.13	4.51	5.38	0.0	2.67	3.53	3.38	6.40	6.40	5.87	6.20	5.76	6.84	6.36	6.38	6.89	3.38	4.82	6.02
7 DEFY	3.73	3.36	2.89	2.47	4.78	2.67	0.0	4.04	2.93	6.44	6.58	6.07	6.56	6.07	6.56	6.47	6.73	7.40	2.36	4.29	6.80
8 COMPETE WITH	4.76	4.16	4.38	4.02	4.78	3.53	4.04	0.0	3.58	6.18	6.38	5.51	6.00	4.71	6.51	6.11	6.09	5.87	5.20	4.91	5.76
9 HAVE CONTEMPT	3.60	3.73	3.00	3.27	4.76	3.38	2.93	3.58	0.0	6.29	6.42	5.80	6.22	5.84	5.80	6.04	6.49	5.98	3.44	4.31	6.31
10 ADVISE	6.80	6.49	6.29	6.24	5.16	6.40	6.44	6.18	6.29	0.0	2.31	3.18	2.24	2.82	4.62	4.13	2.96	4.16	6.56	5.64	3.87
11 CONSOLE	7.22	6.96	6.76	6.58	5.11	6.40	6.58	6.38	6.42	2.31	0.0	3.98	1.69	3.02	4.33	3.33	2.64	4.18	6.49	6.42	3.29
12 REFORM	6.27	5.98	5.82	6.31	5.51	5.87	6.07	5.51	5.80	3.18	3.98	0.0	3.80	4.33	4.27	4.02	4.40	3.80	6.00	5.58	3.87
13 REASSURE	6.89	6.58	6.91	6.62	4.40	6.20	6.56	6.00	6.22	2.24	1.69	3.80	0.0	2.62	4.18	3.51	2.82	4.11	6.84	6.36	2.51
14 BE ATTENTIVE	5.98	5.78	5.91	5.64	4.71	5.76	6.07	4.71	5.84	2.82	3.02	4.33	2.62	0.0	3.96	4.16	3.11	2.73	6.82	5.89	3.53
15 BE SUBMISSIVE	6.44	6.16	6.11	5.93	4.58	6.84	6.56	6.51	5.80	4.62	4.33	4.27	4.18	3.96	0.0	3.27	4.11	2.62	5.82	5.24	3.89
16 CONFESS TO	6.71	6.62	5.89	6.51	5.73	6.36	6.47	6.11	6.04	4.13	3.33	4.02	3.51	4.16	3.27	0.0	1.89	3.89	6.13	5.58	3.84
17 CONFIDE IN	6.84	6.71	6.60	6.60	5.20	6.38	6.73	6.09	6.49	2.96	2.64	4.40	2.82	3.11	4.11	1.89	0.0	4.29	6.53	6.07	3.04
18 OBEY	6.56	6.47	7.00	6.73	5.29	6.89	7.40	5.87	5.98	4.16	4.18	3.80	4.11	2.73	2.62	3.89	4.29	0.0	7.22	5.84	2.73
19 DISREGARD	4.02	4.18	3.20	3.53	5.38	3.38	2.36	5.20	3.44	6.56	6.49	6.00	6.84	6.82	5.82	6.13	6.53	7.22	0.0	4.47	6.47
20 CONFUSE	4.98	4.24	3.73	4.22	4.53	4.82	4.29	4.91	4.31	5.64	6.42	5.58	6.36	5.89	5.24	5.58	6.07	5.84	4.47	0.0	5.71
21 PROMISE	6.49	6.56	7.04	6.73	5.16	6.02	6.80	5.76	6.31	3.87	3.29	3.87	2.51	3.53	3.89	3.84	3.04	2.73	6.47	5.71	0.0

INTERPERSONAL VERBS

SEMANTIC SIMILARITY STANDARD DEVIATIONS FOR 45 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 MOLEST	0.0	1.03	1.48	1.59	1.99	1.94	1.75	1.91	1.64	0.69	0.67	1.39	1.07	1.48	1.55	1.04	1.00	1.27	1.88	1.54	1.12
2 AMBUSH	1.03	0.0	1.51	1.41	1.78	1.91	1.38	1.86	1.80	0.79	0.88	1.42	1.18	1.48	1.64	0.96	0.84	1.08	1.70	1.80	0.97
3 BETRAY	1.48	1.51	0.0	1.05	1.73	1.56	1.85	1.74	1.55	1.18	1.05	1.54	1.06	0.79	1.42	1.48	1.18	1.46	1.65	1.53	1.35
4 CHEAT	1.59	1.41	1.05	0.0	1.90	1.63	1.38	1.74	1.36	1.11	1.36	1.28	1.13	1.54	1.29	1.18	0.99	1.10	1.52	1.40	1.30
5 SEDUCE	1.99	1.78	1.73	1.90	0.0	1.71	1.88	1.78	1.84	1.49	1.77	1.39	1.50	1.67	2.02	1.39	1.65	1.60	1.60	1.59	1.72
6 RESIST	1.94	1.91	1.56	1.63	1.71	0.0	1.97	2.03	1.57	0.99	1.03	1.60	1.01	1.67	1.69	1.28	1.28	1.47	1.77	1.35	1.22
7 DEFY	1.75	1.38	1.85	1.38	1.88	1.97	0.0	2.06	1.68	0.99	1.06	1.45	1.08	1.40	1.44	1.18	0.81	1.32	1.46	1.52	1.22
8 COMPETE WITH	1.91	1.86	1.74	1.74	1.78	2.03	2.06	0.0	1.80	1.19	1.11	1.18	1.26	2.13	1.27	1.35	1.38	1.41	1.63	1.56	1.30
9 HAVE CONTEMPT	1.64	1.80	1.55	1.36	1.84	1.57	1.68	1.80	0.0	1.20	1.12	1.42	1.36	1.35	1.49	1.31	1.20	1.44	2.07	1.59	1.06
10 ADVISE	0.69	0.79	1.18	1.11	1.49	0.99	0.99	1.19	1.20	0.0	1.16	1.43	1.11	1.25	1.37	1.59	1.41	1.68	0.87	1.75	1.12
11 CONSOLE	0.67	0.88	1.05	1.36	1.77	1.03	1.06	1.11	1.12	1.16	0.0	1.32	0.82	1.39	1.69	1.48	1.42	1.30	1.04	0.97	1.10
12 REFORM	1.39	1.42	1.54	1.28	1.39	1.60	1.45	1.18	1.42	1.43	1.32	0.0	1.39	1.41	1.86	1.74	1.54	1.83	1.31	1.23	1.39
13 REASSURE	1.07	1.18	1.06	1.13	1.50	1.01	1.08	1.26	1.36	1.11	0.82	1.39	0.0	1.23	1.47	1.41	1.17	1.25	0.74	1.30	1.27
14 BE ATTENTIVE	1.48	1.48	0.79	1.54	1.67	1.67	1.40	2.13	1.35	1.25	1.39	1.41	1.23	0.0	1.48	1.36	1.70	1.18	1.42	1.28	1.24
15 BE SUBMISSIVE	1.55	1.64	1.42	1.29	2.02	1.69	1.44	1.27	1.49	1.37	1.69	1.86	1.47	1.48	0.0	1.51	1.47	1.96	1.43	1.33	1.56
16 CONFESS TO	1.04	0.96	1.48	1.18	1.39	1.28	1.18	1.35	1.31	1.59	1.48	1.74	1.41	1.36	1.51	0.0	1.07	1.54	1.06	1.14	1.52
17 CONFIDE IN	1.00	0.84	1.18	0.99	1.65	1.28	0.81	1.38	1.20	1.41	1.42	1.54	1.17	1.70	1.47	1.07	0.0	1.55	1.20	1.18	1.26
18 OBEY	1.27	1.08	1.46	1.10	1.60	1.47	1.32	1.41	1.44	1.68	1.30	1.83	1.25	1.18	1.96	1.54	1.55	0.0	0.77	1.11	1.25
19 DISREGARD	1.88	1.70	1.65	1.52	1.60	1.77	1.46	1.63	2.07	0.87	1.04	1.31	0.74	1.42	1.43	1.06	1.20	0.77	0.0	1.39	1.14
20 CONFUSE	1.54	1.80	1.53	1.40	1.59	1.35	1.52	1.56	1.59	1.75	0.97	1.23	1.30	1.28	1.33	1.14	1.18	1.11	1.39	0.0	1.27
21 PROMISE	1.12	0.97	1.35	1.30	1.72	1.22	1.22	1.30	1.06	1.12	1.10	1.39	1.27	1.24	1.56	1.52	1.26	1.25	1.14	1.27	0.0

APPENDIX D3: TOOLS TERMS

SEMANTIC SIMILARITY DISTANCES FOR 12 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 HOE	0.0	1.58	4.17	4.50	1.50	4.67	4.50	5.25	4.58	3.50	4.75	6.58	6.75	6.75	6.92	6.58	6.75	6.67	6.58	6.58	4.33
2 RAKE	1.58	0.0	4.75	4.58	2.33	5.17	5.42	4.33	5.67	3.08	3.08	6.75	6.75	6.67	6.75	6.50	6.42	5.75	6.50	6.33	5.67
3 HAMMER	4.17	4.75	0.0	4.33	4.67	3.50	4.58	5.50	2.17	6.17	5.50	6.08	6.58	6.92	6.33	5.92	5.92	6.58	6.25	6.58	3.17
4 SAW	4.50	4.58	4.33	0.0	4.67	2.75	5.00	4.17	3.17	5.50	5.75	6.67	6.83	6.33	6.25	6.50	6.75	6.42	6.58	6.42	3.83
5 SHOVEL	1.50	2.33	4.67	4.67	0.0	3.75	4.58	5.58	3.75	4.08	4.92	6.83	6.42	6.75	6.58	5.50	6.42	6.92	6.75	6.75	4.83
6 DRILL	4.67	5.17	3.50	2.75	3.75	0.0	4.08	3.50	2.17	5.67	5.83	6.33	5.83	5.83	6.83	6.17	5.83	6.67	6.50	6.33	2.50
7 CLAMP	4.50	5.42	4.58	5.00	4.58	4.08	0.0	2.08	5.00	6.17	6.00	3.92	5.58	5.92	6.25	4.58	4.92	6.00	6.25	5.92	3.08
8 WIRE	5.25	4.33	5.50	4.17	5.58	3.50	2.08	0.0	5.08	3.58	3.58	5.25	6.00	6.08	6.33	5.42	6.33	6.50	6.17	6.08	2.83
9 CHISEL	4.58	5.67	2.17	3.17	3.75	2.17	5.00	5.08	0.0	4.67	5.17	6.50	6.83	6.42	6.67	5.58	5.83	6.17	6.83	6.42	3.08
10 WHISK	3.50	3.08	6.17	5.50	4.08	5.67	6.17	3.58	4.67	0.0	1.58	6.17	5.92	6.17	5.50	5.92	5.75	4.67	4.75	5.75	6.00
11 BRUSH	4.75	3.08	5.50	5.75	4.92	5.83	6.00	3.58	5.17	1.58	0.0	5.08	5.50	6.00	3.42	5.75	5.58	4.50	5.42	4.83	5.08
12 GLUE	6.58	6.75	6.08	6.67	6.83	6.33	3.92	5.25	6.50	6.17	5.08	0.0	3.83	3.92	3.50	1.75	2.33	4.25	3.67	2.92	4.75
13 OIL	6.75	6.75	6.58	6.83	6.42	5.83	5.58	6.00	6.83	5.92	5.50	3.83	0.0	1.33	2.75	5.17	4.50	2.33	2.17	2.58	6.50
14 GREASE	6.75	6.67	6.92	6.33	6.75	5.83	5.92	6.08	6.42	6.17	6.00	3.92	1.33	0.0	2.83	4.75	4.08	2.17	2.67	3.33	6.42
15 PAINT	6.92	6.75	6.33	6.25	6.58	6.83	6.25	6.33	6.67	5.50	3.42	3.50	2.75	2.83	0.0	3.92	2.58	2.58	3.00	1.75	6.42
16 CEMENT	6.58	6.50	5.92	6.50	5.50	6.17	4.58	5.42	5.58	5.92	5.75	1.75	5.17	4.75	3.92	0.0	1.50	4.42	4.17	4.25	5.08
17 PLASTER	6.75	6.42	5.92	6.75	6.42	5.83	4.92	6.33	5.83	5.75	5.58	2.33	4.50	4.08	2.58	1.50	0.0	3.58	4.08	3.58	5.50
18 POLISH	6.67	5.75	6.58	6.42	6.92	6.67	6.00	6.50	6.17	4.67	4.50	4.25	2.33	2.17	2.58	4.42	3.58	0.0	1.33	1.50	6.33
19 WAX	6.58	6.50	6.25	6.58	6.75	6.50	6.25	6.17	6.83	4.75	5.42	3.67	2.17	2.67	3.00	4.17	4.08	1.33	0.0	1.83	6.00
20 VARNISH	6.58	6.33	6.58	6.42	6.75	6.33	5.92	6.08	6.42	5.75	4.83	2.92	2.58	3.33	1.75	4.25	3.58	1.50	1.83	0.0	6.50
21 NAIL	4.33	5.67	3.17	3.83	4.83	2.50	3.08	2.83	3.08	6.00	5.08	4.75	6.50	6.42	6.42	5.08	5.50	6.33	6.00	6.50	0.0

TOOLS TERMS

SEMANTIC SIMILARITY STANDARD DEVIATIONS FOR 12 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 HOE	0.0	0.79	1.34	1.78	0.67	1.23	1.68	0.97	1.83	1.93	1.96	0.90	0.62	0.62	0.67	0.67	0.62	1.07	0.90	0.67	1.30
2 RAKE	0.79	0.0	1.60	1.38	0.89	0.83	1.00	1.30	1.07	1.73	1.62	0.45	0.45	0.78	0.62	0.80	0.67	1.42	1.09	0.89	1.23
3 HAMMER	1.34	1.60	0.0	1.87	1.50	1.51	1.93	1.38	1.70	1.27	1.78	1.16	0.67	0.51	1.78	0.67	1.38	1.00	1.86	0.51	1.47
4 SAW	1.78	1.38	1.87	0.0	1.50	1.14	1.48	1.75	1.70	1.31	1.14	0.49	0.94	1.23	1.86	1.00	0.75	0.90	0.67	1.00	1.75
5 SHOVEL	0.67	0.89	1.50	1.50	0.0	1.42	1.44	1.16	1.29	1.38	1.62	0.58	1.51	0.75	0.90	1.45	0.90	0.51	0.62	0.62	1.11
6 DRILL	1.23	0.83	1.51	1.14	1.42	0.0	1.73	1.83	1.27	1.30	1.11	1.15	1.90	1.59	0.39	1.11	1.34	1.15	0.80	0.65	1.09
7 CLAMP	1.68	1.00	1.93	1.48	1.44	1.73	0.0	1.16	1.76	0.94	1.28	2.11	1.44	1.16	1.36	1.73	1.93	1.13	0.87	1.24	1.93
8 WIRE	0.97	1.30	1.38	1.75	1.16	1.83	1.16	0.0	1.78	1.78	1.73	1.86	1.04	1.08	1.30	1.56	1.07	1.09	1.19	1.31	1.34
9 CHISEL	1.83	1.07	1.70	1.70	1.29	1.27	1.76	1.78	0.0	1.97	0.94	1.00	0.72	1.31	0.78	1.88	1.70	1.40	0.39	0.90	1.31
10 WHISK	1.93	1.73	1.27	1.31	1.38	1.30	0.94	1.78	1.97	0.0	0.90	0.83	1.93	1.03	1.24	0.90	1.36	1.67	1.71	1.29	1.41
11 BRUSH	1.96	1.62	1.78	1.14	1.62	1.11	1.28	1.73	0.94	0.90	0.0	1.83	1.73	1.13	1.62	1.06	1.51	1.73	1.00	1.47	1.68
12 GLUE	0.90	0.45	1.16	0.49	0.58	1.15	2.11	1.86	1.00	0.83	1.83	0.0	1.59	1.68	1.09	1.22	0.98	1.29	1.56	0.79	1.96
13 OIL	0.62	0.45	0.67	0.94	1.51	1.90	1.44	1.04	0.72	1.93	1.73	1.59	0.0	0.49	1.42	1.59	1.88	0.89	0.72	1.08	0.80
14 GREASE	0.62	0.78	0.51	1.23	0.75	1.59	1.16	1.08	1.31	1.03	1.13	1.68	0.49	0.0	1.03	1.82	1.78	0.94	1.15	1.44	0.90
15 PAINT	0.67	0.62	1.78	1.86	0.90	0.39	1.36	1.30	0.78	1.24	1.62	1.09	1.42	1.03	0.0	1.88	1.08	0.90	1.04	0.97	0.79
16 CEMENT	0.67	0.80	0.67	1.00	1.45	1.11	1.73	1.56	1.88	0.90	1.06	1.22	1.59	1.82	1.88	0.0	0.52	1.31	1.53	1.54	1.56
17 PLASTER	0.62	0.67	1.38	0.75	0.90	1.34	1.93	1.07	1.70	1.36	1.51	0.98	1.88	1.78	1.08	0.52	0.0	1.51	1.73	1.44	1.45
18 POLISH	1.07	1.42	1.00	0.90	0.51	1.15	1.13	1.09	1.40	1.67	1.73	1.29	0.89	0.94	0.90	1.31	1.51	0.0	0.49	0.52	0.89
19 WAX	0.90	1.09	1.86	0.67	0.62	0.80	0.87	1.19	0.39	1.71	1.00	1.56	0.72	1.15	1.04	1.53	1.73	0.49	0.0	0.72	1.41
20 VARNISH	0.67	0.89	0.51	1.00	0.62	0.65	1.24	1.31	0.90	1.29	1.47	0.79	1.08	1.44	0.97	1.54	1.44	0.52	0.72	0.0	0.80
21 NAIL	1.30	1.23	1.47	1.75	1.11	1.09	1.93	1.34	1.31	1.41	1.68	1.96	0.80	0.90	0.79	1.56	1.45	0.89	1.41	0.80	0.0

TOOLS TERMS

GROUP 1 SORTING DISTANCES FOR 11 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2 CEMENT	1.00																			
3 CHISEL	.364	1.00																		
4 CLAMP	.455	.818	.364																	
5 DRILL	.273	1.00	.091	.455																
6 GLUE	.909	.273	.909	.727	.909															
7 GREASE	1.00	.909	1.00	1.00	1.00	.818														
8 HAMMER	.273	1.00	.091	.455	.000	.909	1.00													
9 HOE	.273	1.00	.091	.455	.000	.909	1.00	.000												
10 NAIL	.727	.636	.727	.364	.727	.636	1.00	.727	.727											
11 OIL	1.00	.909	1.00	1.00	1.00	.909	.091	1.00	1.00	1.00										
12 PAINT	1.00	.818	1.00	1.00	1.00	.909	.727	1.00	1.00	1.00	.636									
13 PLASTER	1.00	.091	1.00	.909	1.00	.364	.818	1.00	1.00	.727	.818	.727								
14 POLISH	.818	.909	.909	.909	.909	.818	.818	.909	.909	.909	.727	.182	.818							
15 RAKE	.182	1.00	.182	.455	.091	.909	1.00	.091	.091	.727	1.00	1.00	1.00	.909						
16 SAW	.273	1.00	.091	.455	.000	.909	1.00	.000	.000	.727	1.00	1.00	1.00	.909	.091					
17 SHOVEL	.273	1.00	.091	.455	.000	.909	1.00	.000	.000	.727	1.00	1.00	1.00	.909	.091	.0				
18 VARNISH	.909	.909	.909	.909	.909	.818	.727	.909	.909	.909	.636	.091	.818	.091	.909	.909	.909			
19 WAX	.909	.909	1.00	1.00	1.00	.818	.636	1.00	1.00	1.00	.727	.273	.818	.182	1.00	1.00	1.00	.273		
20 WHISK	.273	1.00	.273	.364	.182	.909	1.00	.182	.182	.636	1.00	1.00	1.00	.909	.091	.182	.182	.909	1.00	
21 WIRE	.818	.545	.818	.455	.818	.727	1.00	.818	.818	.091	1.00	.909	.636	1.00	.818	.818	.818	1.00	1.00	.727

TOOLS TERMS

GROUP 2 SORTING DISTANCES FOR 41 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2 CEMENT	.902																			
3 CHISEL	.805	1.00																		
4 CLAMP	.805	.902	.366																	
5 DRILL	.854	1.00	.073	.366																
6 GLUE	.878	.220	.927	.780	.927															
7 GREASE	.951	.951	.976	1.00	.976	.878														
8 HAMMER	.829	.976	.122	.366	.146	.902	.976													
9 HOE	.951	1.00	.951	1.00	.951	1.00	1.00	.951												
10 NAIL	.878	.902	.341	.244	.390	.829	.976	.317	1.00											
11 OIL	.976	.927	1.00	1.00	1.00	.854	.073	1.00	1.00	1.00										
12 PAINT	.683	.756	1.00	.976	1.00	.756	.805	.976	1.00	1.00	.780									
13 PLASTER	.878	.171	1.00	.927	1.00	.390	1.00	.976	1.00	.951	.976	.585								
14 POLISH	.805	.878	1.00	1.00	1.00	.854	.634	.976	1.00	1.00	.610	.293	.756							
15 RAKE	.951	1.00	.951	1.00	.951	1.00	1.00	.951	.000	1.00	1.00	1.00	1.00	1.00						
16 SAW	.854	1.00	.122	.366	.049	.927	.976	.098	.927	.366	1.00	1.00	1.00	1.00	.927					
17 SHOVEL	.951	1.00	.902	1.00	.902	1.00	1.00	.902	.073	1.00	1.00	1.00	1.00	.976	.073	.878				
18 VARNISH	.756	.829	1.00	.976	1.00	.829	.683	.976	1.00	1.00	.659	.171	.659	.122	1.00	1.00	1.00			
19 WAX	.829	.854	1.00	1.00	1.00	.829	.610	.976	1.00	1.00	.585	.317	.780	.024	1.00	1.00	.976	.146		
20 WHISK	.439	.951	.829	.878	.878	.976	.951	.878	.805	.902	.976	.927	.951	.927	.805	.902	.854	.902	.927	
21 WIRE	.829	.854	.707	.488	.756	.805	.976	.732	.976	.415	.951	.976	.927	1.00	.976	.756	.976	.976	1.00	.805

TOOLS TERMS

GROUP 3 SORTING DISTANCES FOR 7 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2 CEMENT	.857																			
3 CHISEL	1.00	1.00																		
4 CLAMP	1.00	1.00	.429																	
5 DRILL	1.00	1.00	.000	.429																
6 GLUE	.857	.000	1.00	1.00	1.00															
7 GREASE	.857	.000	1.00	1.00	1.00	.000														
8 HAMMER	1.00	1.00	.143	.571	.143	1.00	1.00													
9 HOE	.857	1.00	1.00	1.00	1.00	1.00	1.00	1.00												
10 NAIL	.857	1.00	.714	.857	.714	1.00	1.00	.571	1.00											
11 OIL	.857	.000	1.00	1.00	1.00	.000	.000	1.00	1.00	1.00										
12 PAINT	.857	.000	1.00	1.00	1.00	.000	.000	1.00	1.00	1.00	.000									
13 PLASTER	.857	.000	1.00	1.00	1.00	.000	.000	1.00	1.00	1.00	.000	.000								
14 POLISH	.857	.000	1.00	1.00	1.00	.000	.000	1.00	1.00	1.00	.000	.000	.000							
15 RAKE	.857	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.000	1.00	1.00	1.00	1.00	1.00						
16 SAW	1.00	1.00	.286	.571	.286	1.00	1.00	.143	1.00	.714	1.00	1.00	1.00	1.00	1.00					
17 SHOVEL	.857	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.000	1.00	1.00	1.00	1.00	1.00	.000	1.00				
18 VARNISH	.857	.000	1.00	1.00	1.00	.000	.000	1.00	1.00	1.00	.000	.000	.000	.000	1.00	1.00	1.00			
19 WAX	.857	.000	1.00	1.00	1.00	.000	.000	1.00	1.00	1.00	.000	.000	.000	.000	1.00	1.00	1.00	.000		
20 WHISK	.000	.857	1.00	1.00	1.00	.857	.857	1.00	.857	.857	.857	.857	.857	.857	.857	1.00	.857	.857	.857	
21 WIRE	.857	1.00	.857	.857	.857	1.00	1.00	.857	1.00	.286	1.00	1.00	1.00	1.00	1.00	.857	1.00	1.00	1.00	.857

APPENDIX D4: FURNITURE TERMS

SEMANTIC SIMILARITY AVERAGE DISTANCES FOR 15 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 CHAIR	0.0	2.73	5.13	6.60	5.20	4.80	6.87	6.47	5.67	3.20	3.07	1.80	7.13	6.73	6.07	3.20	6.33	2.87	3.00	4.13	5.73
2 CHESTERFIELD	2.73	0.0	6.33	6.33	6.27	3.00	6.67	6.80	5.60	3.60	4.27	4.60	7.20	6.60	6.40	4.27	6.47	1.67	1.73	2.87	5.93
3 TABLE	5.13	6.33	0.0	4.53	2.13	5.73	5.00	5.60	2.00	5.47	3.20	5.13	5.20	5.27	4.40	5.33	3.67	6.33	6.07	6.07	1.47
4 DRESSER	6.60	6.33	4.53	0.0	3.00	6.20	3.27	4.27	4.73	6.33	5.27	6.00	3.87	2.07	2.07	6.47	3.67	6.73	6.00	6.73	5.00
5 DESK	5.20	6.27	2.13	3.00	0.0	6.40	3.20	4.93	3.80	6.20	4.33	5.87	4.80	3.67	3.87	6.47	3.87	6.53	6.47	6.53	3.33
6 BED	4.80	3.00	5.73	6.20	6.40	0.0	7.07	7.13	6.07	4.47	4.73	5.67	7.00	6.53	6.60	5.00	6.73	2.93	2.60	1.33	6.40
7 BOOKCASE	6.87	6.67	5.00	3.27	3.20	7.07	0.0	3.13	4.93	7.00	5.60	6.60	2.47	1.80	3.00	6.80	1.53	6.87	6.67	6.73	5.00
8 RACK	6.47	6.80	5.60	4.27	4.93	7.13	3.13	0.0	5.07	6.80	4.87	5.67	3.80	3.87	4.07	6.60	2.80	6.53	6.87	6.67	5.20
9 COFFEETABLE	5.67	5.60	2.00	4.73	3.80	6.07	4.93	5.07	0.0	5.60	4.00	5.33	5.73	5.60	5.00	4.80	4.20	5.80	6.07	6.07	1.80
10 HASSOCK	3.20	3.60	5.47	6.33	6.20	4.47	7.00	6.80	5.60	0.0	4.33	3.00	7.07	6.73	6.40	1.93	6.13	3.40	3.40	4.40	5.93
11 BENCH	3.07	4.27	3.20	5.27	4.33	4.73	5.60	4.87	4.00	4.33	0.0	2.47	6.53	6.40	5.67	3.73	4.67	4.40	4.20	4.07	3.87
12 STOOL	1.80	4.60	5.13	6.00	5.87	5.67	6.60	5.67	5.33	3.00	2.47	0.0	6.87	6.60	5.60	2.13	5.73	3.80	4.33	5.07	5.13
13 CUPBOARD	7.13	7.20	5.20	3.87	4.80	7.00	2.47	3.80	5.73	7.07	6.53	6.87	0.0	1.93	3.00	6.87	2.13	7.07	6.87	6.80	5.47
14 CABINET	6.73	6.60	5.27	2.07	3.67	6.53	1.80	3.87	5.60	6.73	6.40	6.60	1.93	0.0	2.40	7.00	2.60	6.87	6.87	6.53	5.20
15 CHEST	6.07	6.40	4.40	2.07	3.87	6.60	3.00	4.07	5.00	6.40	5.67	5.60	3.00	2.40	0.0	6.53	3.87	6.67	6.67	6.87	5.60
16 OTTOMAN	3.20	4.27	5.33	6.47	6.47	5.00	6.80	6.60	4.80	1.93	3.73	2.13	6.87	7.00	6.53	0.0	6.60	3.60	4.47	4.67	5.60
17 SHELF	6.33	6.47	3.67	3.67	3.87	6.73	1.53	2.80	4.20	6.13	4.67	5.73	2.13	2.60	3.87	6.60	0.0	6.53	6.87	6.53	4.47
18 LOVESEAT	2.87	1.67	6.33	6.73	6.53	2.93	6.87	6.53	5.80	3.40	4.40	3.80	7.07	6.87	6.67	3.60	6.53	0.0	1.87	3.27	6.00
19 SOFA	3.00	1.73	6.07	6.00	6.47	2.60	6.67	6.87	6.07	3.40	4.20	4.33	6.87	6.87	6.67	4.47	6.87	1.87	0.0	2.93	6.20
20 COT	4.13	2.87	6.07	6.73	6.53	1.33	6.73	6.67	6.07	4.40	4.07	5.07	6.80	6.53	6.87	4.67	6.53	3.27	2.93	0.0	5.73
21 CARDTABLE	5.73	5.93	1.47	5.00	3.33	6.40	5.00	5.20	1.80	5.93	3.87	5.13	5.47	5.20	5.60	5.60	4.47	6.00	6.20	5.73	0.0

FURNITURE TERMS

SEMANTIC SIMILARITY STANDARD DEVIATIONS FOR 15 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 CHAIR	0.0	0.80	1.81	0.63	1.61	1.66	0.52	1.13	1.50	1.47	1.71	0.86	0.35	0.70	0.80	1.47	1.35	1.60	1.31	1.55	1.39
2 CHESTERFIELD	0.80	0.0	0.98	0.72	0.88	1.73	0.72	0.86	1.55	1.35	1.94	1.99	0.41	0.63	1.18	1.53	1.13	0.82	1.79	1.41	1.33
3 TABLE	1.81	0.98	0.0	1.64	1.13	1.53	1.25	1.18	1.89	1.19	1.42	1.36	1.52	1.39	1.35	1.23	0.82	0.98	1.03	1.49	0.64
4 DRESSER	0.63	0.72	1.64	0.0	1.69	1.37	1.53	1.28	1.39	1.11	1.53	1.56	2.00	0.80	1.53	0.64	1.40	0.46	1.51	0.59	1.56
5 DESK	1.61	0.88	1.13	1.69	0.0	1.18	1.42	1.53	1.21	0.94	1.63	1.25	1.78	1.40	0.99	0.83	1.30	1.30	0.83	0.83	1.84
6 BED	1.66	1.73	1.53	1.37	1.18	0.0	0.46	0.74	1.39	1.46	1.87	1.35	0.53	0.64	0.51	1.69	0.96	1.10	1.35	0.49	1.35
7 BOOKCASE	0.52	0.72	1.25	1.53	1.42	0.46	0.0	1.60	1.91	0.53	1.50	1.12	1.19	0.56	1.36	0.41	0.64	0.83	0.90	0.59	1.73
8 RACK	1.13	0.86	1.18	1.28	1.53	0.74	1.60	0.0	1.33	0.94	2.13	1.68	1.61	2.10	1.33	1.06	1.93	1.13	0.74	0.82	1.37
9 COFFEETABLE	1.50	1.55	1.89	1.39	1.21	1.39	1.91	1.33	0.0	1.40	1.96	1.11	1.62	1.12	1.41	1.47	0.77	1.26	1.16	1.58	0.86
10 HASSOCK	1.47	1.35	1.19	1.11	0.94	1.46	0.53	0.94	1.40	0.0	1.84	1.93	0.70	0.46	1.12	1.33	1.19	1.18	1.12	1.80	1.22
11 BENCH	1.71	1.94	1.42	1.53	1.63	1.87	1.50	2.13	1.96	1.84	0.0	1.81	1.19	1.06	1.29	1.39	1.54	2.41	1.97	1.75	1.55
12 STOOL	0.86	1.99	1.36	1.56	1.25	1.35	1.12	1.68	1.11	1.93	1.81	0.0	0.74	0.74	1.72	1.51	1.16	1.08	1.80	1.49	1.13
13 CUPBOARD	0.35	0.41	1.52	2.00	1.78	0.53	1.19	1.61	1.62	0.70	1.19	0.74	0.0	0.88	1.46	0.52	1.51	0.46	0.52	0.56	1.64
14 CABINET	0.70	0.63	1.39	0.80	1.40	0.64	0.56	2.10	1.12	0.46	1.06	0.74	0.88	0.0	1.50	0.65	1.55	0.74	0.64	0.74	1.70
15 CHEST	0.80	1.18	1.35	1.53	0.99	0.51	1.36	1.33	1.41	1.12	1.29	1.72	1.46	1.50	0.0	1.41	1.30	0.72	1.05	0.52	1.30
16 OTTOMAN	1.47	1.53	1.23	0.64	0.83	1.69	0.41	1.06	1.47	1.33	1.39	1.51	0.52	0.65	1.41	0.0	1.06	1.12	1.19	1.11	1.06
17 SHELF	1.35	1.13	0.82	1.40	1.30	0.96	0.64	1.93	0.77	1.19	1.54	1.16	1.51	1.55	1.30	1.06	0.0	1.19	0.74	0.92	1.13
18 LOVESEAT	1.60	0.82	0.98	0.46	1.30	1.10	0.83	1.13	1.26	1.18	2.41	1.08	0.46	0.74	0.72	1.12	1.19	0.0	1.36	1.33	1.25
19 SOFA	1.31	1.79	1.03	1.51	0.83	1.35	0.90	0.74	1.16	1.12	1.97	1.80	0.52	0.64	1.05	1.19	0.74	1.36	0.0	1.53	1.08
20 COT	1.55	1.41	1.49	0.59	0.83	0.49	0.59	0.82	1.58	1.80	1.75	1.49	0.56	0.74	0.52	1.11	0.92	1.33	1.53	0.0	1.22
21 CARDTABLE	1.39	1.33	0.64	1.56	1.84	1.35	1.73	1.37	0.86	1.22	1.55	1.13	1.64	1.70	1.30	1.06	1.13	1.25	1.08	1.22	0.0

FURNITURE TERMS

GROUP 1 SORTING DISTANCES FOR 45 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2 BENCH	.911																			
3 BOOKCASE	1.00	1.00																		
4 CABINET	.978	1.00	.267																	
5 CARDTABLE	1.00	.911	.978	.978																
6 CHAIR	.844	.156	1.00	1.00	.978															
7 CHEST	.978	.978	.400	.156	.956	1.00														
8 CHESTERFIELD	.778	.400	1.00	1.00	1.00	.267	1.00													
9 COFFEETABLE	1.00	.911	.956	.978	.022	.978	.956	1.00												
10 COT	.022	.911	1.00	.978	1.00	.844	.978	.756	1.00											
11 CUPBOARD	1.00	1.00	.200	.133	.978	1.00	.289	1.00	.978	1.00										
12 DESK	.933	.911	.844	.778	.400	.911	.689	.956	.400	.933	.778									
13 DRESSER	.933	.978	.467	.267	.911	.978	.111	1.00	.911	.933	.378	.622								
14 HASSOCK	.822	.756	.933	.956	.911	.822	.956	.733	.889	.822	.956	.911	.956							
15 LOVESEAT	.800	.378	1.00	1.00	.978	.244	1.00	.022	.978	.778	1.00	.933	1.00	.756						
16 OTTOMAN	.933	.733	.933	.933	.933	.800	.933	.644	.933	.933	.933	.956	.956	.333	.644					
17 RACK	1.00	.978	.067	.311	.933	1.00	.444	1.00	.933	1.00	.244	.867	.511	.933	1.00	.911				
18 SHELF	.978	.978	.089	.333	.956	.956	.467	1.00	.956	.978	.222	.800	.467	.956	.978	.933	.111			
19 SOFA	.800	.400	.978	.978	1.00	.289	.978	.022	1.00	.778	.978	.978	.978	.733	.044	.644	1.00	.978		
20 STOOL	.911	.311	1.00	1.00	.956	.422	1.00	.622	.956	.911	1.00	.956	1.00	.511	.600	.444	.978	.978	.622	
21 TABLE	1.00	.889	.978	.978	.067	.956	.956	.978	.067	1.00	.933	.444	.911	.911	.956	.933	.933	.933	.978	.956

FURNITURE TERMS

GROUP 2 SORTING DISTANCES FOR 8 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2 BENCH	.875																			
3 BOOKCASE	1.00	.875																		
4 CABINET	1.00	.875	.750																	
5 CARDTABLE	.875	.625	.625	.750																
6 CHAIR	.875	1.00	1.00	.750	1.00															
7 CHEST	.0	.875	1.00	1.00	.875	.875														
8 CHESTERFIELD	1.00	.875	.750	.875	.875	.500	1.00													
9 COFFEETABLE	1.00	.875	.750	.750	.875	.625	1.00	.125												
10 COT	.375	.750	.875	1.00	.750	1.00	.375	1.00	1.00											
11 CUPBOARD	.875	.625	1.00	.500	.750	.500	.875	1.00	1.00	1.00										
12 DESK	.875	.625	.250	.750	.625	1.00	.875	1.00	1.00	.625	1.00									
13 DRESSER	.0	.875	1.00	1.00	.875	.875	.0	1.00	1.00	.375	.875	.875								
14 HASSOCK	1.00	.625	.750	.875	.625	.625	1.00	.500	.625	.875	.875	.750	1.00							
15 LOVESEAT	1.00	.875	.750	.875	.875	.500	1.00	.0	.125	1.00	1.00	1.00	1.00	.500						
16 OTTOMAN	.875	.750	.875	1.00	.875	.500	.875	.250	.375	1.00	1.00	1.00	.875	.375	.250					
17 RACK	.875	.875	.875	.500	.750	.500	.875	.750	.875	1.00	.500	.875	.875	.750	.750	.750				
18 SHELF	1.00	.875	.500	.250	.625	.750	1.00	1.00	1.00	.875	.500	.500	1.00	.875	1.00	1.00	.500			
19 SOFA	1.00	.875	.625	1.00	.875	.500	1.00	.125	.250	.875	1.00	.875	1.00	.500	.125	.250	.750	.875		
20 STOOL	1.00	.875	.875	.625	.875	.500	1.00	.750	.875	.875	.500	.875	1.00	.875	.750	.750	.250	.500	.625	
21 TABLE	.875	.750	1.00	.625	.750	.375	.875	.875	.875	1.00	.125	1.00	.875	.750	.875	.875	.625	.625	.875	.625

APPENDIX D5: PRONOUNS

SEMANTIC SIMILARITY AVERAGE DISTANCES FOR 49 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 I	0.0	1.47	2.20	5.35	5.67	4.63	5.08	5.67	5.33	5.12	5.53	6.12	4.00	4.02	4.59	6.24	6.39	6.69	3.10
2 ME	1.47	0.0	1.84	5.45	6.14	4.98	4.90	5.76	5.33	5.16	5.90	6.06	4.04	4.12	4.35	6.61	6.53	6.65	3.61
3 MY	2.20	1.84	0.0	5.71	5.10	5.73	5.65	5.65	5.92	5.29	4.94	5.33	4.76	4.73	3.65	6.51	6.41	6.08	4.08
4 YOU	5.35	5.45	5.71	0.0	2.12	4.10	4.16	5.47	4.55	4.53	4.90	5.69	5.29	5.37	5.51	5.08	5.16	5.59	3.76
5 YOUR	5.67	6.14	5.10	2.12	0.0	5.65	5.43	5.71	5.53	4.51	4.49	4.55	5.88	5.73	4.31	5.53	5.45	4.63	5.06
6 HE	4.63	4.98	5.73	4.10	5.65	0.0	4.84	4.57	1.84	5.22	1.92	5.51	4.84	5.33	5.78	5.53	5.33	5.78	3.53
7 SHE	5.08	4.90	5.65	4.16	5.43	4.84	0.0	5.02	4.88	1.88	5.35	5.55	5.12	5.29	5.86	5.04	5.53	5.71	3.71
8 IT	5.67	5.76	5.65	5.47	5.71	4.57	5.02	0.0	5.22	5.16	5.00	1.98	6.08	6.27	5.73	5.80	6.04	5.59	2.80
9 HIM	5.33	5.33	5.92	4.55	5.53	1.84	4.88	5.22	0.0	4.55	1.94	5.78	5.67	5.20	5.76	5.14	4.80	5.29	4.12
10 HER	5.12	5.16	5.29	4.53	4.51	5.22	1.88	5.16	4.55	0.0	4.47	5.37	5.12	5.55	5.33	5.55	5.02	5.06	4.16
11 HIS	5.53	5.90	4.94	4.90	4.49	1.92	5.35	5.00	1.94	4.47	0.0	4.59	5.71	5.69	5.18	5.55	5.29	4.49	4.37
12 ITS	6.12	6.06	5.33	5.69	4.55	5.51	5.55	1.98	5.78	5.37	4.59	0.0	6.16	6.02	5.27	5.45	5.43	4.29	4.61
13 WE	4.00	4.04	4.76	5.29	5.88	4.84	5.12	6.08	5.67	5.12	5.71	6.16	0.0	1.82	2.61	5.57	5.53	5.76	5.94
14 US	4.02	4.12	4.73	5.37	5.73	5.33	5.29	6.27	5.20	5.55	5.69	6.02	1.82	0.0	2.20	5.76	5.37	5.69	5.90
15 OUR	4.59	4.35	3.65	5.51	4.31	5.78	5.86	5.73	5.76	5.33	5.18	5.27	2.61	2.20	0.0	6.12	6.16	5.20	5.98
16 THEY	6.24	6.61	6.51	5.08	5.53	5.53	5.04	5.80	5.14	5.55	5.55	5.45	5.57	5.76	6.12	0.0	2.35	2.43	6.16
17 THEM	6.39	6.53	6.41	5.16	5.45	5.33	5.53	6.04	4.80	5.02	5.29	5.43	5.53	5.37	6.16	2.35	0.0	2.43	6.57
18 THEIR	6.69	6.65	6.08	5.59	4.63	5.78	5.71	5.59	5.29	5.06	4.49	4.29	5.76	5.69	5.20	2.43	2.43	0.0	6.29
19 ONE	3.10	3.61	4.08	3.76	5.06	3.53	3.71	2.80	4.12	4.16	4.37	4.61	5.94	5.90	5.98	6.16	6.57	6.29	0.0

PRONOUNS

SEMANTIC SIMILARITY STANDARD DEVIATIONS FOR 49 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 I	0.0	0.77	1.54	2.36	1.43	1.76	1.95	1.80	1.53	1.59	1.61	1.56	1.86	1.92	1.85	1.65	1.35	1.28	1.96
2 ME	0.77	0.0	1.03	2.14	1.10	1.71	1.84	1.63	1.39	1.59	1.26	1.34	1.78	1.81	1.60	1.11	1.29	0.86	1.90
3 MY	1.54	1.03	0.0	1.66	2.00	1.20	1.55	1.70	1.53	1.67	1.88	2.06	1.60	1.80	1.77	1.24	1.06	1.59	1.92
4 YOU	2.36	2.14	1.66	0.0	1.27	1.33	1.36	1.61	1.65	1.60	1.21	1.43	1.89	1.90	1.62	1.87	1.68	1.71	2.19
5 YOUR	1.43	1.10	2.00	1.27	0.0	1.32	1.46	1.41	1.32	1.49	1.53	1.86	1.29	1.47	2.09	1.61	1.44	1.92	1.93
6 HE	1.76	1.71	1.20	1.33	1.32	0.0	2.71	1.67	1.09	2.18	1.00	1.54	1.64	1.23	1.16	1.43	1.25	1.34	1.67
7 SHE	1.95	1.84	1.55	1.36	1.46	2.71	0.0	1.57	2.18	1.44	1.92	1.37	1.68	1.17	1.44	1.58	1.58	1.44	1.71
8 IT	1.80	1.63	1.70	1.61	1.41	1.67	1.57	0.0	1.78	1.50	1.70	1.46	1.35	1.32	1.52	1.62	1.55	1.74	1.80
9 HIM	1.53	1.39	1.53	1.65	1.32	1.09	2.18	1.78	0.0	2.68	1.23	1.36	1.39	1.44	1.07	1.34	1.43	1.53	1.82
10 HER	1.59	1.59	1.67	1.60	1.49	2.18	1.44	1.50	2.68	0.0	2.53	1.65	1.64	1.23	1.49	1.40	1.60	1.56	1.80
11 HIS	1.61	1.26	1.88	1.21	1.53	1.00	1.92	1.70	1.23	2.53	0.0	1.80	1.32	1.28	1.65	1.54	1.65	1.56	1.81
12 ITS	1.56	1.34	2.06	1.43	1.86	1.54	1.37	1.46	1.36	1.65	1.80	0.0	1.23	1.30	1.89	1.62	1.76	1.98	2.09
13 WE	1.86	1.78	1.60	1.89	1.29	1.64	1.68	1.35	1.39	1.64	1.32	1.23	0.0	1.20	1.60	2.09	1.89	1.45	1.66
14 US	1.92	1.81	1.80	1.90	1.47	1.23	1.17	1.32	1.44	1.23	1.28	1.30	1.20	0.0	1.34	1.95	2.09	1.46	1.62
15 OUR	1.85	1.60	1.77	1.62	2.09	1.16	1.44	1.52	1.07	1.49	1.65	1.89	1.60	1.34	0.0	1.39	1.31	2.21	1.55
16 THEY	1.65	1.11	1.24	1.87	1.61	1.43	1.58	1.62	1.34	1.40	1.54	1.62	2.09	1.95	1.39	0.0	1.71	1.66	1.82
17 THEM	1.35	1.29	1.06	1.68	1.44	1.25	1.58	1.55	1.43	1.60	1.65	1.76	1.89	2.09	1.31	1.71	0.0	1.78	1.32
18 THEIR	1.28	0.86	1.59	1.71	1.92	1.34	1.44	1.74	1.53	1.56	1.56	1.98	1.45	1.46	2.21	1.66	1.78	0.0	1.40
19 ONE	1.96	1.90	1.92	2.19	1.93	1.67	1.71	1.80	1.82	1.80	1.81	2.09	1.66	1.62	1.55	1.82	1.32	1.40	0.0

APPENDIX D6: KINSHIP TERMS

GROUP 1 SEMANTIC SIMILARITY AVERAGE DISTANCES FOR 28 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 MOTHER	0.0	2.89	4.89	3.04	6.21	3.29	6.07	3.79	6.39	4.96	5.96	6.43	2.29	6.64	4.50
2 FATHER	2.89	0.0	3.00	5.32	3.36	5.96	4.25	5.71	5.07	6.54	5.71	2.32	5.89	4.50	6.46
3 SON	4.89	3.00	0.0	3.46	4.89	6.64	3.25	5.50	4.29	6.39	5.25	4.79	6.71	2.61	6.04
4 DAUGHTER	3.04	5.32	3.46	0.0	6.57	4.68	5.46	3.64	6.25	3.96	5.11	6.75	4.79	6.04	2.68
5 UNCLE	6.21	3.36	4.89	6.57	0.0	2.93	3.39	6.43	3.21	4.57	3.75	4.50	6.11	5.43	6.93
6 AUNT	3.29	5.96	6.64	4.68	2.93	0.0	6.71	4.57	4.79	3.32	4.21	6.43	4.61	6.79	5.54
7 BROTHER	6.07	4.25	3.25	5.46	3.39	6.71	0.0	2.43	4.07	6.46	4.39	4.68	6.71	4.11	6.71
8 SISTER	3.79	5.71	5.50	3.64	6.43	4.57	2.43	0.0	6.21	4.11	5.25	6.32	4.93	6.46	4.32
9 NEPHEW	6.39	5.07	4.29	6.25	3.21	4.79	4.07	6.21	0.0	2.46	3.50	5.96	7.00	4.39	6.68
10 NIECE	4.96	6.54	6.39	3.96	4.57	3.32	6.46	4.11	2.46	0.0	3.43	6.79	5.86	6.39	5.36
11 COUSIN	5.96	5.71	5.25	5.11	3.75	4.21	4.39	5.25	3.50	3.43	0.0	5.89	6.18	4.82	5.46
12 GRANDFATHER	6.43	2.32	4.79	6.75	4.50	6.43	4.68	6.32	5.96	6.79	5.89	0.0	2.54	4.11	5.89
13 GRANDMOTHER	2.29	5.89	6.71	4.79	6.11	4.61	6.71	4.93	7.00	5.86	6.18	2.54	0.0	5.25	4.25
14 GRANDSON	6.64	4.50	2.61	6.04	5.43	6.79	4.11	6.46	4.39	6.39	4.82	4.11	5.25	0.0	3.39
15 GRANDDAUGHTER	4.50	6.46	6.04	2.68	6.93	5.54	6.71	4.32	6.68	5.36	5.46	5.89	4.25	3.39	0.0

KINSHIP TERMS

GROUP 1 SEMANTIC SIMILARITY STANDARD DEVIATIONS FOR 28 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 MOTHER	0.0	1.87	2.08	1.37	1.52	1.12	1.39	1.34	1.03	1.43	1.43	1.71	1.33	0.83	1.58
2 FATHER	1.87	0.0	1.70	2.02	1.31	1.77	1.51	1.70	1.46	1.14	1.36	1.22	1.91	1.50	1.20
3 SON	2.08	1.70	0.0	2.24	1.52	1.47	1.29	1.69	1.56	1.47	1.43	1.79	1.15	1.20	1.79
4 DAUGHTER	1.37	2.02	2.24	0.0	1.00	1.70	1.55	1.59	1.40	1.62	1.71	1.29	1.79	1.79	1.39
5 UNCLE	1.52	1.31	1.52	1.00	0.0	2.11	1.40	1.29	1.26	1.93	1.17	1.40	1.62	1.29	0.86
6 AUNT	1.12	1.77	1.47	1.70	2.11	0.0	1.24	1.29	1.69	1.70	1.29	1.35	1.31	0.74	1.45
7 BROTHER	1.39	1.51	1.29	1.55	1.40	1.24	0.0	1.60	1.33	1.14	1.64	1.39	1.01	1.69	0.85
8 SISTER	1.34	1.70	1.69	1.59	1.29	1.29	1.60	0.0	1.23	1.47	1.55	0.98	1.49	1.37	1.33
9 NEPHEW	1.03	1.46	1.56	1.40	1.26	1.69	1.33	1.23	0.0	1.69	1.69	1.40	0.72	1.81	1.44
10 NIECE	1.43	1.14	1.47	1.62	1.93	1.70	1.14	1.47	1.69	0.0	1.45	1.17	1.33	1.64	1.45
11 COUSIN	1.43	1.36	1.43	1.71	1.17	1.29	1.64	1.55	1.69	1.45	0.0	1.26	1.25	1.63	1.77
12 GRANDFATHER	1.71	1.22	1.79	1.29	1.40	1.35	1.39	0.98	1.40	1.17	1.26	0.0	1.97	2.27	2.38
13 GRANDMOTHER	1.33	1.91	1.15	1.79	1.62	1.31	1.01	1.49	0.72	1.33	1.25	1.97	0.0	2.34	2.37
14 GRANDSON	0.83	1.50	1.20	1.79	1.29	0.74	1.69	1.37	1.81	1.64	1.63	2.27	2.34	0.0	2.45
15 GRANDDAUGHTER	1.58	1.20	1.79	1.39	0.86	1.45	0.85	1.33	1.44	1.45	1.77	2.38	2.37	2.45	0.0

KINSHIP TERMS

GROUP 2 SEMANTIC SIMILARITY AVERAGE DISTANCES FOR 45 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 MOTHER	0.0	2.16	3.16	2.71	6.16	4.62	4.24	3.73	5.71	5.49	5.91	4.89	3.78	5.33	4.22
2 FATHER	2.16	0.0	2.58	3.47	5.11	5.56	3.53	4.56	5.40	6.16	6.22	3.84	5.31	4.71	4.87
3 SON	3.16	2.58	0.0	3.53	5.33	6.29	3.67	5.13	5.13	6.36	5.78	4.64	5.27	4.04	6.20
4 DAUGHTER	2.71	3.47	3.53	0.0	5.96	5.89	5.00	3.96	6.22	5.27	6.07	5.04	4.27	5.49	4.36
5 UNCLE	6.16	5.11	5.33	5.96	0.0	2.27	4.84	6.11	3.38	3.47	4.24	5.84	6.18	6.24	6.42
6 AUNT	4.62	5.56	6.29	5.89	2.27	0.0	6.40	5.31	3.27	3.31	3.98	6.33	5.73	6.64	5.80
7 BROTHER	4.24	3.53	3.67	5.00	4.84	6.40	0.0	2.58	5.33	6.13	5.93	5.60	5.96	5.20	6.49
8 SISTER	3.73	4.56	5.13	3.96	6.11	5.31	2.58	0.0	6.44	5.51	5.73	5.98	5.44	6.73	5.13
9 NEPHEW	5.71	5.40	5.13	6.22	3.38	3.27	5.33	6.44	0.0	2.80	4.49	6.16	6.04	6.22	6.53
10 NIECE	5.49	6.16	6.36	5.27	3.47	3.31	6.13	5.51	2.80	0.0	4.36	6.33	6.00	6.91	5.67
11 COUSIN	5.91	6.22	5.78	6.07	4.24	3.98	5.93	5.73	4.49	4.36	0.0	6.62	6.22	6.31	6.42
12 GRANDFATHER	4.89	3.84	4.64	5.04	5.84	6.33	5.60	5.98	6.16	6.33	6.62	0.0	2.67	2.38	2.93
13 GRANDMOTHER	3.78	5.31	5.27	4.27	6.18	5.73	5.96	5.44	6.04	6.00	6.22	2.67	0.0	3.04	2.98
14 GRANDSON	5.33	4.71	4.04	5.49	6.24	6.64	5.20	6.73	6.22	6.91	6.31	2.38	3.04	0.0	2.80
15 GRANDDAUGHTER	4.22	4.87	6.20	4.36	6.42	5.80	6.49	5.13	6.53	5.67	6.42	2.93	2.98	2.80	0.0

KINSHIP TERMS

GROUP 2 SEMANTIC SIMILARITY STANDARD DEVIATIONS FOR 45 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 MOTHER	0.0	1.35	1.46	1.42	1.43	1.68	1.77	1.45	1.59	1.39	1.74	1.67	1.76	1.67	1.59
2 FATHER	1.35	0.0	1.18	1.75	1.73	1.67	1.27	1.78	1.51	1.41	1.64	1.87	1.81	1.56	1.79
3 SON	1.46	1.18	0.0	2.29	1.52	1.46	1.67	1.71	1.88	1.37	1.40	1.51	1.53	1.93	1.65
4 DAUGHTER	1.42	1.75	2.29	0.0	1.57	1.57	1.91	1.92	1.41	1.66	1.59	1.61	1.42	1.80	1.82
5 UNCLE	1.43	1.73	1.52	1.57	0.0	1.29	1.71	1.34	1.74	1.75	2.10	1.52	1.57	1.45	1.50
6 AUNT	1.68	1.67	1.46	1.57	1.29	0.0	1.63	1.73	1.81	1.74	1.94	1.62	1.59	1.25	1.63
7 BROTHER	1.77	1.27	1.67	1.91	1.71	1.63	0.0	1.79	1.72	1.59	1.37	1.47	1.61	1.83	1.46
8 SISTER	1.45	1.78	1.71	1.92	1.34	1.73	1.79	0.0	1.47	1.47	1.34	1.70	1.75	1.53	1.52
9 NEPHEW	1.59	1.51	1.88	1.41	1.74	1.81	1.72	1.47	0.0	1.91	2.10	1.28	1.49	1.54	1.60
10 NIECE	1.39	1.41	1.37	1.66	1.75	1.74	1.59	1.47	1.91	0.0	1.97	1.89	1.45	1.52	1.72
11 COUSIN	1.74	1.64	1.40	1.59	2.10	1.94	1.37	1.34	2.10	1.97	0.0	1.28	1.33	1.26	1.22
12 GRANDFATHER	1.67	1.87	1.51	1.61	1.52	1.62	1.47	1.70	1.28	1.89	1.28	0.0	2.12	0.89	1.39
13 GRANDMOTHER	1.76	1.81	1.53	1.42	1.57	1.59	1.61	1.75	1.49	1.45	1.33	2.12	0.0	1.33	1.48
14 GRANDSON	1.67	1.56	1.93	1.80	1.45	1.25	1.83	1.53	1.54	1.52	1.26	0.89	1.33	0.0	1.67
15 GRANDDAUGHTER	1.59	1.79	1.65	1.82	1.50	1.63	1.46	1.52	1.60	1.72	1.22	1.39	1.48	1.67	0.0

KINSHIP TERMS

GROUP 3 SEMANTIC SIMILARITY AVERAGE DISTANCES FOR 14 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 MOTHER	0.0	6.71	6.64	3.21	6.43	2.79	6.50	3.36	6.64	4.21	5.07	6.57	1.93	6.43	3.64
2 FATHER	6.71	0.0	3.14	6.29	3.00	6.50	3.29	6.21	4.07	6.64	5.43	2.50	6.79	3.79	6.86
3 SON	6.64	3.14	0.0	5.43	4.00	6.50	2.00	6.00	3.14	6.71	4.36	4.00	6.71	2.50	6.50
4 DAUGHTER	3.21	6.29	5.43	0.0	6.57	3.57	6.21	2.50	6.79	2.79	5.14	6.57	4.00	6.50	2.29
5 UNCLE	6.43	3.00	4.00	6.57	0.0	5.50	3.00	6.93	4.07	6.79	4.50	3.71	6.64	4.57	6.86
6 AUNT	2.79	6.50	6.50	3.57	5.50	0.0	6.71	3.07	5.57	4.14	4.00	6.71	3.43	6.71	4.21
7 BROTHER	6.50	3.29	2.00	6.21	3.00	6.71	0.0	5.64	3.86	6.50	5.29	3.21	6.79	3.00	6.57
8 SISTER	3.36	6.21	6.00	2.50	6.93	3.07	5.64	0.0	5.86	3.14	4.79	7.14	3.64	6.50	3.50
9 NEPHEW	6.64	4.07	3.14	6.79	4.07	5.57	3.86	5.86	0.0	5.79	2.43	5.21	6.57	3.21	6.21
10 NIECE	4.21	6.64	6.71	2.79	6.79	4.14	6.50	3.14	5.79	0.0	3.29	7.00	4.50	5.57	2.79
11 COUSIN	5.07	5.43	4.36	5.14	4.50	4.00	5.29	4.79	2.43	3.29	0.0	5.71	5.93	4.07	4.79
12 GRANDFATHER	6.57	2.50	4.00	6.57	3.71	6.71	3.21	7.14	5.21	7.00	5.71	0.0	5.50	4.57	6.36
13 GRANDMOTHER	1.93	6.79	6.71	4.00	6.64	3.43	6.79	3.64	6.57	4.50	5.93	5.50	0.0	6.29	4.00
14 GRANDSON	6.43	3.79	2.50	6.50	4.57	6.71	3.00	6.50	3.21	5.57	4.07	4.57	6.29	0.0	5.00
15 GRANDDAUGHTER	3.64	6.86	6.50	2.29	6.86	4.21	6.57	3.50	6.21	2.79	4.79	6.36	4.00	5.00	0.0

KINSHIP TERMS

GROUP 3 STANDARD DEVIATIONS FOR 14 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 MOTHER	0.0	1.20	0.84	0.58	1.34	1.12	0.76	1.69	0.74	1.58	1.33	1.22	0.83	1.02	1.15
2 FATHER	1.20	0.0	1.35	1.33	1.04	1.22	0.91	1.72	1.14	0.84	1.40	1.09	0.97	1.31	0.66
3 SON	0.84	1.35	0.0	1.95	1.66	1.02	0.68	1.36	1.66	0.83	2.02	1.36	0.73	0.94	0.65
4 DAUGHTER	0.58	1.33	1.95	0.0	1.28	1.28	1.48	1.02	0.80	1.48	1.96	1.50	1.52	0.94	1.07
5 UNCLE	1.34	1.04	1.66	1.28	0.0	1.95	1.24	0.47	1.38	1.05	1.79	1.27	0.63	1.28	0.66
6 AUNT	1.12	1.22	1.02	1.28	1.95	0.0	0.73	1.07	1.83	1.23	1.66	1.33	1.02	0.83	1.25
7 BROTHER	0.76	0.91	0.68	1.48	1.24	0.73	0.0	1.65	1.51	0.94	1.86	1.25	0.70	1.04	0.65
8 SISTER	1.69	1.72	1.36	1.02	0.47	1.07	1.65	0.0	1.29	0.53	2.04	0.36	1.45	0.85	1.09
9 NEPHEW	0.74	1.14	1.66	0.80	1.38	1.83	1.51	1.29	0.0	2.12	1.28	1.42	1.02	1.42	1.37
10 NIECE	1.58	0.84	0.83	1.48	1.05	1.23	0.94	0.53	2.12	0.0	1.82	0.88	1.22	1.79	0.89
11 COUSIN	1.33	1.40	2.02	1.96	1.79	1.66	1.86	2.04	1.28	1.82	0.0	1.44	1.07	1.44	1.93
12 GRANDFATHER	1.22	1.09	1.36	1.50	1.27	1.33	1.25	0.36	1.42	0.88	1.44	0.0	1.95	1.79	1.82
13 GRANDMOTHER	0.83	0.97	0.73	1.52	0.63	1.02	0.70	1.45	1.02	1.22	1.07	1.95	0.0	1.54	1.62
14 GRANDSON	1.02	1.31	0.94	0.94	1.28	0.83	1.04	0.85	1.42	1.79	1.44	1.79	1.54	0.0	2.08
15 GRANDDAUGHTER	1.15	0.66	0.65	1.07	0.66	1.25	0.65	1.09	1.37	0.89	1.93	1.82	1.62	2.08	0.0

KINSHIP TERMS

GROUP 1 SORTING DISTANCES FOR 31 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2 FATHER	0.0													
3 SON	0.516	0.516												
4 DAUGHTER	0.516	0.516	0.0											
5 UNCLE	1.000	1.000	1.000	1.000										
6 AUNT	1.000	1.000	1.000	1.000	0.0									
7 BROTHER	0.710	0.710	0.903	0.903	0.935	0.935								
8 SISTER	0.710	0.710	0.903	0.903	0.935	0.935	0.0							
9 NEPHEW	1.000	1.000	1.000	1.000	0.677	0.677	0.871	0.871						
10 NIECE	1.000	1.000	1.000	1.000	0.677	0.677	0.871	0.871	0.0					
11 COUSIN	1.000	1.000	1.000	1.000	0.452	0.452	1.000	1.000	0.548	0.548				
12 GRANDFATHER	0.968	0.968	1.000	1.000	0.871	0.871	1.000	1.000	1.000	1.000	1.000			
13 GRANDMOTHER	0.968	0.968	1.000	1.000	0.871	0.871	1.000	1.000	1.000	1.000	1.000	0.0		
14 GRANDSON	1.000	1.000	0.935	0.935	0.968	0.968	0.968	0.968	0.935	0.935	1.000	0.419	0.419	
15 GRANDDAUGHTER	1.000	1.000	0.935	0.935	0.968	0.968	0.968	0.968	0.935	0.935	1.000	0.419	0.419	0.0

KINSHIP TERMS

GROUP 2 SORTING DISTANCES FOR 7 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2 FATHER	0.0													
3 SON	1.000	1.000												
4 DAUGHTER	1.000	1.000	0.0											
5 UNCLE	0.0	0.0	1.000	1.000										
6 AUNT	0.0	0.0	1.000	1.000	0.0									
7 BROTHER	1.000	1.000	0.857	0.857	1.000	1.000								
8 SISTER	1.000	1.000	0.857	0.857	1.000	1.000	0.0							
9 NEPHEW	1.000	1.000	0.143	0.143	1.000	1.000	0.857	0.857						
10 NIECE	1.000	1.000	0.143	0.143	1.000	1.000	0.857	0.857	0.0					
11 COUSIN	1.000	1.000	0.857	0.857	1.000	1.000	0.0	0.0	0.857	0.857				
12 GRANDFATHER	0.857	0.857	1.000	1.000	0.857	0.857	1.000	1.000	1.000	1.000	1.000			
13 GRANDMOTHER	0.857	0.857	1.000	1.000	0.857	0.857	1.000	1.000	1.000	1.000	1.000	0.0		
14 GRANDSON	1.000	1.000	0.714	0.714	1.000	1.000	0.857	0.857	0.714	0.714	0.857	1.000	1.000	
15 GRANDDAUGHTER	1.000	1.000	0.714	0.714	1.000	1.000	0.857	0.857	0.714	0.714	0.857	1.000	1.000	0.0

KINSHIP TERMS

GROUP 3 SORTING DISTANCES FOR 14 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2 FATHER	0.0													
3 SON	0.0	0.0												
4 DAUGHTER	0.0	0.0	0.0											
5 UNCLE	1.000	1.000	1.000	1.000										
6 AUNT	1.000	1.000	1.000	1.000	0.071									
7 BROTHER	0.0	0.0	0.0	0.0	1.000	1.000								
8 SISTER	0.0	0.0	0.0	0.0	1.000	1.000	0.0							
9 NEPHEW	0.929	0.929	0.929	0.929	0.143	0.214	0.929	0.929						
10 NIECE	0.929	0.929	0.929	0.929	0.214	0.143	0.929	0.929	0.071					
11 COUSIN	1.000	1.000	1.000	1.000	0.143	0.214	1.000	1.000	0.143	0.214				
12 GRANDFATHER	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929			
13 GRANDMOTHER	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.929	0.0		
14 GRANDSON	0.857	0.857	0.857	0.857	1.000	1.000	0.857	0.857	1.000	1.000	1.000	0.071	0.071	
15 GRANDDAUGHTER	0.857	0.857	0.857	0.857	1.000	1.000	0.857	0.857	1.000	1.000	1.000	0.071	0.071	0.0

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KINSHIP TERMS

GROUP 4 SORTING DISTANCES FOR 6 SUBJECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2 FATHER	1.000													
3 SON	1.000	0.0												
4 DAUGHTER	0.0	1.000	1.000											
5 UNCLE	1.000	0.500	0.500	1.000										
6 AUNT	0.500	1.000	1.000	0.500	1.000									
7 BROTHER	1.000	0.167	0.167	1.000	0.333	1.000								
8 SISTER	0.167	1.000	1.000	0.167	1.000	0.333	1.000							
9 NEPHEW	1.000	0.500	0.500	1.000	0.0	1.000	0.333	1.000						
10 NIECE	0.500	1.000	1.000	0.500	1.000	0.0	1.000	0.333	1.000					
11 COUSIN	1.000	1.000	1.000	1.000	0.833	1.000	1.000	1.000	0.833	1.000				
12 GRANDFATHER	1.000	0.167	0.167	1.000	0.333	1.000	0.333	1.000	0.333	1.000	1.000			
13 GRANDMOTHER	0.167	1.000	1.000	0.167	1.000	0.333	1.000	0.333	1.000	0.333	1.000	1.000		
14 GRANDSON	1.000	0.167	0.167	1.000	0.333	1.000	0.333	1.000	0.333	1.000	1.000	0.0	1.000	
15 GRANDDAUGHTER	0.167	1.000	1.000	0.167	1.000	0.333	1.000	0.333	1.000	0.333	1.000	1.000	0.0	1.000